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# THE SURGICAL CLINICS OF NORTH AMERICA

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Volume 3

Number 4

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CLINIC OF DR ARTHUR DEAN BEVAN

PRESBYTERIAN HOSPITAL

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## PANCREATIC CYST

*Patient Presenting a Large Abdominal Tumor Extending from the Ensiform Cartilage to About Midway Between the Umbilicus and the Symphysis History as Recorded on Dr Sippy's Service Operation Revealed a Cyst of the Pancreas Discussion of Pancreatic Cysts and the Treatment Employed for Their Relief*

THIS patient a man of fifty five has been referred to my service with a huge abdominal tumor The case offers a very interesting problem in diagnosis The patient has been under the care of Dr B W Sippy for a number of months and from the history taken on Dr Sippy's service I present to you this summary

A man J M fifty five years of age came to Dr Sippy's service March 27th complaining of distress in the abdomen and a tumor in the abdomen The patient stated that he had been troubled with abdominal distress for twenty five years This has been coming on at irregular intervals all this time The longest period that he has been free from distress is for a period of two or three years At times he would have short periods of freedom for a month or two All the attacks have been somewhat similar in character These attacks have been characterized by distress in the abdomen and acute pain The pain however was never so acute that he had to go to bed until a recent

attack at which time he was in bed for several weeks with a temperature varying from 99 to 101 F. He had gotten in the habit of taking bismuth and chalk to relieve his distress. Very often this would do so. On the other hand at times he would fail to obtain relief. Describing a typical day, one in which he had no attack, he stated that he would feel first rate when he got up in the morning before he ate his breakfast. After he ate an ordinary breakfast some distress would come on about 10 o'clock in the morning and it would continue until noon time when he took his lunch it would be followed by relief. He might then have distress at 3 or 4 o'clock in the afternoon. This would continue until he ate his supper which would again give him relief. After supper the distress would come on about 10 o'clock at night. He would usually take some bismuth and chalk and with one or two doses he would obtain relief, all of this sounding very much like the chemical pain of hyperacidity or of a duodenal or gastric ulcer. About six months ago he had a severe attack of acute pain for which he consulted a physician who gave him some morphin for relief. This first attack was followed by a number of subsequent attacks which were relieved with morphin. Two weeks after he had this attack he first noticed a tumor in his abdomen. He states that this has not given him any symptoms. He has however lost 25 pounds since these severe attacks occurred last October.

A general examination fails to reveal facts which would throw any light upon the case. On physical examination there is found a large mass completely filling the space from the ensiform to well below the umbilicus and causing a great forward bulging of the upper portion of the abdomen. This mass is round, perfectly smooth on the surfaces which are accessible to palpation, not tender and moves to a moderate degree with respiration. The mass is raised with each heart beat, apparently from contact with the abdominal aorta. No lateral expansion or pulsation is present. The mass extends somewhat more to the left side than to the right. The liver and spleen are not palpable. There are no other palpable masses in the abdomen. The patient at this time had no temperature. Hemo-

globin was 80 per cent and leukocytes 8500 There was no blood in the stools

At this time a diagnosis of abdominal tumor probably a fibroid growth of the mesentery was made and the patient asked to return for further examination In order to eliminate a possible kidney lesion a pyelogram was made which did not furnish any evidence of value

The patient was continued under observation with a probable diagnosis of fibroid of the mesentery He continued to lose weight and strength until up to the time of operation he had lost about 50 pounds in weight and was in such weakened condition that he had to give up his work

When he came to the hospital a few days ago I found the condition very much the same as that furnished in Dr Sippy's case record with this exception the tumor had evidently grown a great deal in size and now extended from the ensiform cartilage to about midway between the umbilicus and the symphysis and filled the abdomen almost completely extending however more to the left than to the right side

The outstanding facts obtained from this history are as you have noted first the presence of a huge abdominal tumor filling almost the entire abdomen developing in the course of several years gradually and with few symptoms beyond a gradual loss of weight and strength and an occasional acute colic attack We find no definite lesion of any of the abdominal viscera The tumor occupies the center of the abdominal cavity and anatomically may spring from the omentum the mesentery or the pancreas There is no evidence of interference with pancreatic function such as fatty stools and the presence of diabetes

The physical examination of the abdomen gives one the impression that the tumor is partly solid and partly cystic or if it is entirely cystic a cystic tumor with very strong walls containing fluid under a good deal of pressure The x ray has not given us any helpful evidence in making a differential diagnosis My clinical diagnosis before opening the abdomen is a cyst of the omentum or mesentery or cyst of the pancreas

There is no contraindication to a general anesthetic and

Dr Herb has as you have seen given the patient a sequence of gas and ether without any preceding hypodermic of morphin I shall make an incision in the middle line extending from the ensiform to quite well below the umbilicus The peritoneal cavity is now open and the picture which is presented is rather confusing The tumor mass presents itself bulging out of the incision

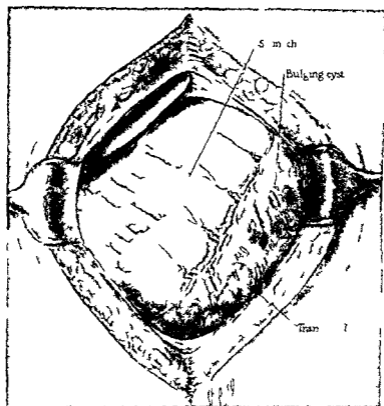


Fig 392

(Fig 392) It seems to be a cyst with very thick walls As I examine the anterior wall however what seems to be the cyst wall is in fact the stomach which is plastered in front of the last cyst The stomach is thinned out and drawn over the anterior wall The anterior and posterior walls of the stomach here are in contact and this part of the stomach does not con

tain any gas or air. On careful examination however one can be sure of these facts as the great omentum takes its origin from the great curvature of the stomach and one can distinctly see the vessels of the greater curvature running into the great omentum at this point. Following along the greater curvature to the liver high up in the abdomen I find an area in which I can expose the wall of the cyst by tearing a small opening in the great omentum. I introduce a good sized needle on a large

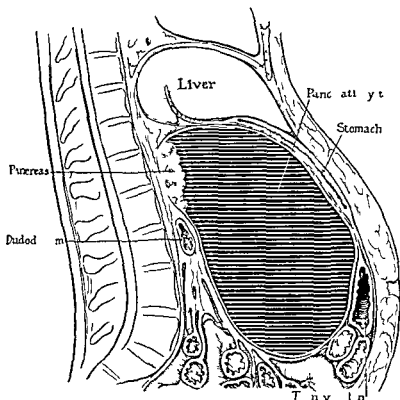


Fig 393

hypodermic syringe into the cyst at this point and draw out a brownish fluid. At this same point I introduce a large trocar such as we employ for ovarian cysts to which I have attached a rubber tube 4 or 5 feet in length and allow the contents of the cyst to pour into a basin on the floor beside the operating table. As the cyst empties itself you see that it contains about 2 gallons of this fluid (Fig 393). From the location of the cyst and from this history there being no history of trauma or previous inflam

matory process I think we must conclude that this is a true pancreatic cyst

We must now decide what plan should be adopted in dealing with this particular case. Can we dissect out the cyst? Is such an operation possible? Should we close the peritoneal cavity down to this opening which we have made in the cyst wall close the opening in the cyst wall temporarily and allow our abdominal incision to heal or at least the plastic peritonitis to wall off the cyst from the rest of the abdominal structures before we institute drainage or shall we provide complete drainage at this primary operation? I shall first of all try to dissect out the cyst wall for a considerable extent and determine whether or not extirpation is feasible. Enlarging the trocar opening so that I can introduce my hand into the interior of the cyst I carefully empty out all of the fluid contents of the cyst and explore the interior. I find in the bottom of the cyst a handful of peculiar material which I now bring into view which look like a grayish mud. This is debris from the lining membrane of the cyst. This condition has been reported a number of times in pancreatic cysts and is therefore in this instance confirmatory of such a diagnosis. In the upper right hand corner of the cyst cavity I find there is a mass of this debris which is so adherent to the interior wall of the cyst that I hesitate to use enough force to remove it being afraid that I shall do some damage to the pancreas or bring on some hemorrhage. With one hand inside the cyst cavity I now begin to peel off the stomach from the anterior cyst wall. I find that the stomach and the cyst are plastered together by very firm adhesions and in attempting to separate the stomach completely from the cyst I make a small opening in the stomach tearing an opening about  $\frac{1}{2}$  inch long in the mucosa. I proceed to repair this at once with three rows of sutures. I find that I can separate the lower portion of the cyst that is the portion below the stomach easier than I can the portion covered by the stomach and you see now that I have brought into view so I can bring it out of the field beyond my abdominal incision 3 or 4 inches of the cyst wall. You notice the wall is about  $\frac{1}{4}$  to  $\frac{1}{2}$  inch thick and so far we have not had

any hemorrhage of any moment from our manipulations in freeing the cyst. It is evident however that it would be impossible to dissect out this entire cyst without removing the pancreas at the same time and of course this is out of the question. I shall therefore bring the cyst wall out through the center of my abdominal incision, close the rest of the abdominal incision and drain the cyst (Fig 394). You will notice that I make the closure of the abdominal wall with six sets of button tension sutures. After closing the peritoneum up to the cyst from below and down to the cyst from above I stitch the cyst wall to the skin with some black silk sutures and introduce into the cyst 2 large

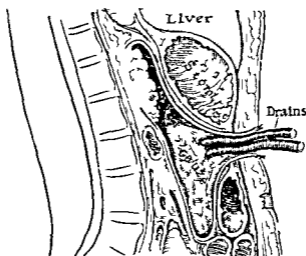


Fig 394

split rubber tubes and some iodoform gauze. From my experience with these pancreatic cysts I am very sure that one of the important pieces of technic is covering the integument of the entire abdomen with a thick layer of sterile zinc-oxid paste because the fluid from most of these cysts has a very powerful digestive action on the integument and produces very destructive lesions which may be serious or even fatal. The patient's general condition is good. I shall simply order normal salt retention enemas 8 ounces every four hours and  $\frac{1}{4}$  grain morphin hypodermically as soon as he wakes up. I see no reason why he should not be given good liquid nourishment the day after the operation.

I am glad of the opportunity of showing you this case. This is the largest pancreatic cyst which I have operated upon and I think one of the largest that I have seen recorded. The pancreatic cysts which I have seen up to this time have none of them contained more than a gallon of fluid. The pancreas has within the last few years excited our interest and study. I think we have added a great deal to our knowledge of this particular field of research and are recognizing pancreatic lesions much more frequently than we did formerly. My former associate Dr. Nicholas Senn contributed one of the early pieces of work on the pancreas. His work consisted in attempting experimentally to produce pancreatic cysts by tying off the pancreatic duct. At that time there were practically no other pancreatic conditions which we recognized clinically. These cysts of course are exceedingly rare. Senn's work was followed a few years later by a contribution of Reginald Fitz of Harvard on acute pancreatitis. Then came the work of Mayo Robson on chronic interstitial pancreatitis, then the work of Mikulicz on the importance of pancreatic injuries in abdominal work and the great necessity of providing thorough drainage in order to prevent the development of pancreatitis and hemorrhage if such injuries occur. Then came the very important work of Opie on the pancreas demonstrating clearly the important relation of the pancreas and the islands of Langerhan to diabetes. Then abdominal surgeons all over the world who were doing a large number of gall stone cases began to recognize the frequency of pancreatic lesions in gall stone cases especially common duct cases. Then came the effort of clinicians to find some laboratory tests which would enable us to differentiate pancreatic lesions from other lesions in the abdominal cavity notably the work of Cammidge. And now the last year we have all been greatly interested in the splendid work of Banting, McLeod and their associates at Toronto in discovering insulin and their demonstration of the great potency of this agent in diabetes. Although the pancreatic lesions still remain in some ways obscure we are gradually unraveling the mystery that heretofore surrounded them.

Taking this case as a basis I want to refer to several other clinical experiences which I have had with pancreatic lesions which I hope may be interesting and instructive

Four or five years ago I operated upon a patient for gall stones in both the gall bladder and common duct. He made an excellent recovery from the operation and returned to his work. About two years later however he was seized with acute abdominal pain and was brought again to the hospital. I found that he had a high temperature was very septic had a mass in the upper abdomen in the middle line which was very painful and very tender on pressure. Under a local anesthetic I opened the midline and came down to a large abscess which had developed in such a way as to push the stomach upward and the transverse colon downward and which came to the surface between these two viscerad. The visceral and parietal layers of the peritoneum were adherent at this point. I opened the abscess with a closed pair of artery forceps and a quart or more of pus escaped and with it some sloughing tissue probably fragments of the pancreas. My technic was not very good because in attempting to mop out the pus from the cavity I produced a rather sharp hemorrhage and I was compelled to pack the abscess cavity with a large amount of iodoform gauze in order to control the bleeding. I mention this because I think it was an error in technic. I should have been satisfied with simply introducing some drainage tubes and allowing the pus to escape. Fortunately however the man went on to recovery. Within the last year however he has developed a grave degree of diabetes and is probably unless we can save his life with the new agent insulin doomed to early fatal termination. This case illustrates the relationship between the gall bladder and resulting infection of the pancreatic duct and pancreatic disease and the destruction of so large a portion of the pancreas as to produce diabetes.

I desire to mention a second case illustrating the traumatic element in these cases. A boy was wrestling in a gymnasium with a school fellow and received a severe blow in the pit of the stomach. This was followed by marked evidence of shock which lasted for some hours. It was evidently followed by in

ternal hemorrhage Within twenty four hours a distinct tumor could be felt in the upper half of the abdomen consistent with being a hemorrhage about the pancreas After a short time sugar appeared in the urine I mention this because I want to state that it is exceptional to find in pancreatic lesions the condition of diabetes Of course where it is found it is very helpful in determining the diagnosis The boy went on to recovery and partial or almost complete disappearance of the abdominal swelling took place followed later however by a gradual development of a definite tumor mass in that region Subsequent operation showed a pseudopancreatic cyst containing about 3 pints of fluid which was handled by drainage and which fortunately resulted in recovery

We have had recently in our service at Presbyterian Hospital in the hands of one of my colleagues Dr D B Phemister another interesting pancreatic cyst which I shall briefly refer to as it furnishes an illustration of another lesion which one must keep in mind The patient was one of Dr Ralph Brown's and after a very careful analysis a clinical diagnosis of pancreatic cyst was made One of the striking features was the evidence obtained by the x ray showing the stomach surrounding the right half of the cyst and shaped like a crescent showing distinctly the fact that the stomach was pushed out from its position and changed into its crescentic form by extramural pressure At operation a cyst in the pancreas was found coming to the surface between the greater curvature of the stomach and the transverse colon and contained about 3 pints of fluid of a brownish red color After withdrawing this fluid with a trocar a more careful examination could be made of the abdominal contents and Dr Phemister could feel a carcinoma involving the head of the pancreas with secondary carcinomatous masses in the liver the associated malignant disease of course making any thought of cure of the pancreatic condition out of the question

**After history**—Finally I want to add a word in regard to the after management of these pancreatic cyst cases and I can do this probably in no better way than relating the experience

which we had with the case just reported. The patient went on to an excellent recovery. There was surprisingly little digestion of the abdominal wall by the fluid and I think in part this was prevented by our very free use of zinc oxid paste. The patient made a very good operative recovery until after we had removed the sutures and then he developed a picture of chills and fever very characteristic of septic thrombophlebitis. There was no local evidence of infection and we were very fearful that septic thrombosis would extend and involve the portal vein and produce a fatal termination. Fortunately however it must have been simply a vein in the wall of the cyst because after three or four chills the evidences of infection disappeared and the patient went on to a very rapid recovery and improvement in weight and strength. In sixty days the patient gained about 50 pounds in weight. A fair sized drainage tube was left in the cyst cavity. For some time after the operation considerable amounts of muddy debris were removed with a gall bladder scoop evidently that portion of the debris which was adherent to the wall and which I did not remove at the time of the operation. The interior of the cyst was irrigated with tincture of iodine in water making a solution about the color of sherry wine until it contracted. We then changed the irrigation to pure tincture of iodine using it once every other day. There is still six months after operation a drainage tube the size of a No. 14 American rubber catheter about 3 inches in length in the fistulous opening. The amount of secretion varies sometimes it is very great saturating some very large dressings which are changed twice a day. It is necessary to still protect the abdomen with zinc oxid paste. I felt that it was wise to maintain drainage for a considerable period of time as in handling these cases our experience has been that if drainage is discontinued too early a redevelopment of the cyst may take place. There comes a time however when it is necessary to discontinue the drainage and desirable to do so when the pancreatic ducts are carrying off the pancreatic secretion they formerly poured into the cyst. At any rate I think one can theorize that such a condition does sometimes occur. I would however give you this warning that

fistulous opening through which came a watery purulent discharge

Under gas ether I made the usual oblique kidney cut and came down to a large irregular abscess which was consistent with being a perinephritic abscess. It was filled with granulation tissue and some foul smelling pus. In making at that time a clinical diagnosis of actinomycosis I emphasized the importance of a broad general surgical training for the specialist who was limiting his field to genito urinary surgery and pointed to this case as an example. I requested my house surgeon to examine very carefully the granulation tissue and the discharges which we removed at operation. I expected confidently that they contain colonies of actinomyces. To my chagrin however the report came back that no colonies of actinomyces were found and that the pus had the appearance of being a degenerated hypernephroma. For a time I accepted that statement and placed the man under x ray treatment under which he improved somewhat.

Several months later however he came again into my clinic and the case impresses me so strongly from the clinical aspects as being actinomycosis that I immediately ordered him again into the hospital and cureted out some of the granulation tissue from the fistulous tract which I had enlarged at the time of the first operation and in the very first section examined under the microscopic were found abundant colonies of actinomyces. Then I sent him to the operating room and under gas ether made a very radical operation opening up the site of the first operation and the region of the kidney and in addition made a muscle splitting incision down on to the indurated mass in the right lower quadrant which proved to be a deep seated abscess with very thick indurated walls and in the pus we again found many colonies of the ray fungus.

With a knowledge of the definite pathology of the condition I felt very much more hopeful of curing the case and have put him on a scheme of management which we have followed out since 1905. In that year I began the use of copper sulphate in an intractable case of abdominal actinomycosis using it both

locally and internally with a resultant cure and I have been using the agent in combination with potassium iodid and x ray since that date. We use the copper sulphate to irrigate fistulous tracts using a 2 per cent solution of copper sulphate and we gave copper sulphate internally  $\frac{1}{4}$  grain in capsules three times a day. In addition we gave moderate doses of potassium iodid not enough to upset the stomach or interfere with the general nutrition of the individual limiting the dosage from 15 to 30 grains three times a day in other words in actinomycosis we use a mixed treatment of copper and potassium iodid just as we use in cases of syphilis a mixed treatment of mercury and potassium iodid. In addition I have been employing x ray treatment in these cases very much as we have employed it in cases of granulomatous masses due to tuberculosis. I am very confident that this combination of copper potassium iodid and x ray has given us very much better results than any other method that we have employed in ray fungus disease.

I want to call your attention to the fact that in such a case as I showed you this morning of actinomycosis involving the abdominal wall that the point of entrance of the organism is through the intestine. The organism gains entrance usually through the cecum or the appendix and extends from that atrium of infection radiating in all directions irrespective of tissues involving organs and muscles fascia and bone without apparently any selective action. We have had a large number of cases of actinomycosis on my service somewhere between 50 and 60. When we began studying these cases carefully about twenty years ago the mortality in abdominal cases was very high probably 70 or 80 per cent almost all of them going on to a fatal termination. With the method of therapy which we have devised we have reduced that mortality to about 30 per cent. This particular patient is now in a rather advanced stage of the disease and yet I am hopeful that we shall be able to eradicate it and eventually restore him to health. My colleague Dr Dean Lewis has recently had another case somewhat similar to this which however was in a very bad condition when he was admitted to the hospital and died within a short time the

postmortem showing an extensive actinomycotic involvement of the kidney I want to emphasize the point that these cases of actinomycosis are as a rule overlooked that the diagnosis is not made and on that account the majority of the patients are not given the benefit of proper surgical and therapeutic management I have had the same experience in a number of cases that we have had in this case of having my younger men come back with a negative report after examining the tissue removed from a suspected case and I have told them that they must keep constantly at the examination of the pus and granulation tissue and then later they have had the satisfaction of finding colonies of ray fungus I have been able in a number of cases to make an accurate clinical diagnosis of actinomycosis before we have obtained any microscopic evidence I do not think this is surprising for as we all know we do not hesitate to make a diagnosis of lupus vulgaris from the clinical picture of the lesion on the face without finding or expecting to find tubercle bacilli in the section of tissue removed We all base the diagnosis on the clinical picture and we can do the same to a more limited extent in cases of actinomycosis The wooden like infiltration involving a wide territory independent of the character of the tissues and the appearance of fistulous tracts lined with granulation tissue the fact that there is no glandular involvement as in many of our chronic inflammations the characteristic picture in the head cases of actinomycosis and in the abdominal cases point very often very strongly to the correct diagnosis

## KIDNEY STONE

Demonstration of a Solid Tumor of the Kidney Removed from a Patient on Whom a Preoperative Diagnosis of Splenic Leukemia Had Been Made

Operation on a Patient for Stones in Kidney History, Diagnosis and Operative Findings Examination of Kidney After Removal Peculiar Stone Formation Found Presentation of a Specimen from a Similar Case in which a Growth of Bone was Found in the Kidney Stone

BEFORE I operate upon a kidney stone case this morning I want to present to you a specimen which I removed at operation last week which is another illustration of the difficulties of diagnosis in the abdominal tract and which teaches I think a very valuable lesson

I was called to operate upon a case which had been carefully analyzed and studied and in which a diagnosis of splenic anemia had been made The patient had a tumor in the left side of the abdomen which seemed to be an enlarged spleen There was great loss of weight and strength and there was evidence of secondary anemia Careful analysis of the case from an x ray standpoint seemed to show that on filling the colon with barium solution this tumor would override the colon as we would expect a splenic tumor to do Careful examination of the urine showed no evidence of blood or any other abnormality The case had been seen by a number of medical men and they were all agreed that it was a case of splenic anemia Because I had been interested in this particular field I was selected as the surgeon to do a splenectomy for the patient When I examined the patient I found she was a small woman weighing about 120 pounds She had previously weighed about 160 The findings which they presented to me seemed to be quite consistent with their diagnosis of primary splenic leukemia and I proceeded to operate with that diagnosis

My assistant Dr Gatewood who was with me in the opera

tion on examining the patient said it seemed to him more like an enlarged kidney than a spleen. The medical consultants however ruled this out because of the relationship of the colon to the tumor the tumor apparently overriding the distended colon. I made therefore the usual S shaped incision on the left side which I have employed for some time in my splenectomies made a very wide exposure of the peritoneal cavity and came down to a huge tumor which was retroperitoneal. The spleen was quite normal. I recognized at once that I had a very large solid tumor of the left kidney to deal with. I therefore divided the outer layer of mesocolon of the descending colon and the splenic flexure pushed the colon to the inner side and removed a huge hypernephroma of the left kidney.

I want simply to cite this case as an example of the difficulties which we have to encounter in abdominal diagnosis and to remind you of the fact that in hypernephroma we find blood in the urine in only about half the cases even where the tumor is very large and there may be no evidence from the urine examination of the kidney involvement.

We shall now proceed to operate upon a patient who has been very carefully gone over by my associate Dr. Robert H. Herbst. This patient a young man of twenty five came to my service about a week ago and Dr. Herbst has made a very careful analysis of the case and I am able to present to you an excellent example of the way that a kidney stone case should be studied.

Clinically he presented a history of repeated kidney colics on the right side. He had never had one on the left side. Examination of the urine showed some red blood corpuscles and some leukocytes. The x ray picture showed as you see in the window a large number of stones in the pelvis—in the upper and lower pelvis—and in the calices of the right kidney (Fig. 395). Ureteral catheters were passed in both kidneys. The thalein test showed the left kidney secreting a normal amount of urine. The thalein test of the right kidney showed it doing much less than its normal work. The blood chemistry examination was normal (see chart Fig. 396). The general physical examina-

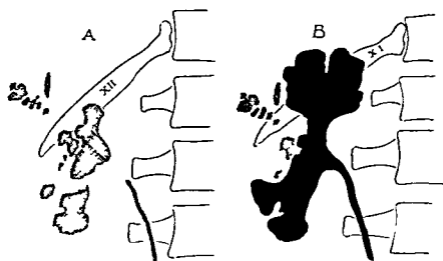


Fig 395 —A x Ray of kidney stones B x Ray showing kidney filled with contrast fluid

### Blood Chemistry

Urea	26
Uric acid	40
Creatinin	13
Non protein N	32

Cell count	Bladder	200
	Left kidney	70
	Right kidney	150
Cultures	Bladder	S. aphylloccus pure culture
	Left kidney	N. growth
	Right kidney	Staphyloccus pure culture

Smears — No tubercle bacilli found

1 23 23 Mr Plank

### Phenolsulphonephthalein

	Left kidney	Right kidney
Dye appeared	2 min.	3 min.
First 15 min.	64 /	36 /
Second 15 min.	58 /	29 /
Second 30 min.	82 /	51 /
Total 60 min.	204 /	116 /
Total both kidneys 60 min		32 /

Fig 396 —Chart showing results of kidney tests

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rib up an inch higher than I otherwise could. This maneuver increases very materially the extent of my exposure and I have found by experience that it is very much better to do this than it is to resect the twelfth rib which is entirely unnecessary. One can obtain quite as much room by this stretching method with a fractured rib if necessary as one can obtain by resection of the twelfth rib. I now very carefully separate the fatty capsule from the fibrous capsule through the entire extent of the kidney and bring the kidney out through the external wound. As I do this I can feel on the surface of the kidney the stones that it contains. The wall for an extent of about 2 inches square is very thin so that I can feel these stones like beans in a bean bag. It is evident from the gross appearance and from the conditions that we find that it would be impossible for us to remove all these stones with any degree of certainty and that if we did these pockets in this damaged kidney would certainly furnish conditions which would produce a recurrence of the stones and make a secondary nephrectomy necessary in order to secure a cure. On that account I decide at once to do a nephrectomy. I shall not separate the ureter from the vessels but simply put a large full curved clamp (Fig 397) the same as the clamps which I use in my cholecystectomy work on the pedicle of the kidney. The pedicle here will consist of the ureter and the vessels. There is no objection to this because there is no evidence of tuberculosis or malignant disease in this case. I cut off the kidney distal to the clamp ligate this rather large pedicle with a strong piece of iodized catgut and then remove the clamp. I now make a second ligation of the pedicle grasping the pedicle a second time with another strong piece of catgut. I make this second ligation for additional protection against hemorrhage. I shall drain this case as I always do with a split rubber tube containing a wick of iodoform gauze. I now close the wound. The method of closure is I think interesting and is one that you can quite advantageously adopt. I shall close with 3 large button tension sutures the same button tension sutures that we use so frequently in our abdominal work. We have found them to be of special value in these kidney cases. They secure perfect apposi-

tion They splint the wound and put it absolutely at rest They furnish the very strongest assurance against postoperative hernia because if necessary we leave them in position for fifteen or twenty days and they place the wound in such a secure position that we do not hesitate to allow our patients to sit up in bed or even in a chair within a few days after operation if condition warrants The muscle layers of the incision we bring

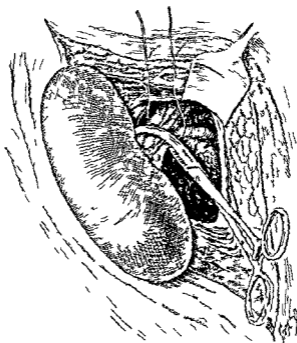


Fig 397 —Use of curved hemocystomy clamp and ligation of kidney pedicle

together accurately with buried catgut using a moderate sized gut as the catgut here simply answers the purpose of approximation the tension being taken by the button sutures

Now let us examine the specimen which we have removed On splitting open the kidney (Fig 398) as we do by an ordinary postmortem cut throughout its entire extent you see that the pelvis and calices are filled with stones and there is this interest

ing fact that two of these stones are embedded and fixed so that we cannot take them out. They seem to be attached to some of the papillæ which have the appearance of growing into the stone. This reminds me of an interesting case which I did a few months

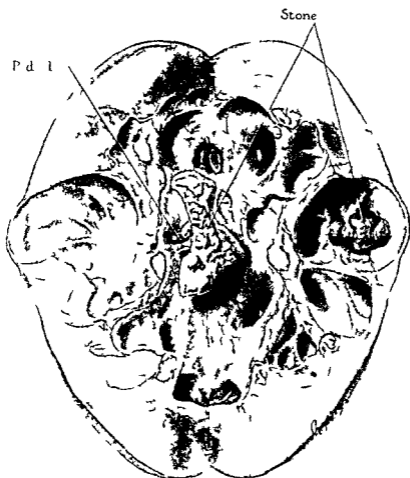


Fig. 398.—Specimen of kidney. Central stone has been displaced to right somewhat in order that attachment may be shown.

ago which was very carefully worked up by my associate Dr. D. B. Phemister. I shall show you this specimen.

Dr. Phemister found on examining the kidney carefully that there was a large U shaped stone which was fixed very tightly to the structures of the kidney, and on careful examination he

found that one of the papillæ of the kidney had grown into the stone and from this papilla a new growth of true bone had grown into the stone for a considerable distance. I have asked Dr Phemister to make a full report of that case and shall ask him to include this case which we have just operated upon in that same report. It will be interesting to analyze carefully these cases in which the stones are fixed to the kidney tissue and to see the method by which such fixation is brought about.

## CLINIC OF DRS E WYLLYS AND EDMUND ANDREWS

### MERCY HOSPITAL

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#### HOURLY GLASS STOMACH

Patient Presenting a Peculiar History of Gastric Distress  
Operation by Another Surgeon Failed to Corroborate the  $x$  Ray  
Diagnosis of Hourly Glass Stomach Recurrence of Symptoms  
Led to Exploratory Operation Hourly Glass Condition Found to  
Be Very Marked Technic of Operation

THE following case is one of Dr Sippy's and has a rather peculiar history For several years there has been considerable gastric distress and vomiting The pain has been of a rather irregular character and has not the usual time relations and is not always relieved by food or alkalis Vomiting has been a constant feature It occurs at unexpected times and is not always accompanied by pain The patient first underwent an appendectomy for the relief of these symptoms They were however not in the least influenced by the operation I do not know who this first operator was Later however she was under the care of a surgeon of wide experience in whose judgment I have every confidence In his hands the case was carefully studied and finally on the basis of repeated  $x$  ray examinations the diagnosis of hourly glass stomach was made He then operated and was very much surprised to find that there was no evidence of constriction about the stomach I do not know just what pathology was encountered but a posterior gastroenterostomy was made This operation also failed to be of benefit

The case has now been under Dr Sippy's observation for several weeks Radiologic examinations made at numerous

times under different conditions have never failed to show the deep incisura on the greater curvature about midway between the pylorus and cardia. These were not affected by the administration of atropin in large doses and therefore do not appear to be contraction waves. They are said by the patient to resemble very closely the plates made before the other operation. As you can see the stoma is still functioning and the pylorus is open. The duodenum appears normal. There is however a slight delay in the emptying of the stomach especially of the proximal pouch. The other examinations have revealed an exceedingly variable acidity both in the aspirations and the vomitus. Blood in the stools has been constant leading to the assumption that active ulceration is present. Wassermann is negative.

I am now going to undertake the operation which is in a sense exploratory. The fact that the former surgeon did not find the hour glass condition even though he looked for it is rather disconcerting. The persistent gastric hemorrhage which has resisted medical treatment and the resulting anemia are however ample justification for surgery. I am making a high midline incision excising the old scar. Here I have the abdomen wide open and note no adhesions from the former operation. The stomach is lifted out and carefully inspected. Its contour is regular and no constriction can be found. Neither can I feel one. I have now palpated the entire stomach and no masses or craters of ulcers can be found. The pylorus is patent and admits the finger tips. I will now raise the transverse colon and omentum and inspect the stoma. This region is also remarkably free from adhesions. Here is the ligament of Treitz and the origin of the jejunum. The loop is short and the stoma quite properly placed. I can find nothing to criticize in the work done here. Neither can I find any evidence of secondary ulceration in the bowel. I had rather expected that this might be the cause of our trouble. Jejunal ulcers have of late been proved too much more common than we formerly believed. They are probably the commonest cause of recurrence of pain after gastro enterostomy.

Now just because I can neither see nor feel anything wrong with this stomach is not much evidence that it is normal In tragastric exploration is the only sure way to rule out ulcer It is only the indurated ulcers that we can palpate I do not fear to lay the stomach widely open It is a procedure which I have carried out repeatedly and I know that it is well tolerated The gastric juice is sterile or nearly so and can be spilled almost with impunity The wound is easy to close and as we can invert the edges all we want with no fear of obstructing the lumen it is very safe

Dr Sippy still sticks to his diagnosis of hour glass stomach He says that many times the constriction involves only the mucosa and cannot be felt or seen from the outside

I am now making an incision in the stomach parallel to and a few centimeters away from the lesser curvature It bleeds furiously and many clamps must be applied to control it This is one of the drawbacks but I do not believe it a vital one We are now getting the hemorrhage under control I might have divided the wall between clamps after the first little nick but it does not seem right to devitalize the tissues so

I see now that Dr Sippy was right There is an hour glass condition and a very marked one It involves the mucosa only The hole between the two pouches is about large enough to admit one finger easily The walls are smooth and no ulcers can be seen There is no scarring or puckering about the fold of mucosa It is soft and contains no scar tissue Here besides my incision I find a tiny erosion I would say that it was a tear made by myself except for one fact It lies exactly under a point to which a tiny wisp of omentum was adherent By slightly curving the incision back upon itself I have excised this ulcer if it is one There are several other bleeding points but I am sure that all are artefacts The gastric mucosa is exquisitely delicate and tears and bleeds with the slightest handling Dr Edmund is now pushing his finger up through the stoma from behind thus inverting as much of the jejunum as possible into the field The suture line is clearly visible but appears normal and no ulcers can be found He is now putting his

times under different conditions have never failed to show the deep incisura on the greater curvature about midway between the pylorus and cardia. These were not affected by the administration of atropin in large doses and therefore do not appear to be contraction waves. They are said by the patient to resemble very closely the plates made before the other operation. As you can see the stoma is still functioning and the pylorus is open. The duodenum appears normal. There is however a slight delay in the emptying of the stomach especially of the proximal pouch. The other examinations have revealed an exceedingly variable acidity both in the aspirations and the vomitus. Blood in the stools has been constant leading to the assumption that active ulceration is present. Wassermann is negative.

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without another step and much more safely than by a gastro-gastrostomy Dr Edmund has now seized the middle of each side of the incision in Allis forceps and by gently drawing them upward and apart the cut is rendered a transverse one He now rapidly runs a whip stitch along the mucosa This controls most of the bleeding The muscular and fibrous coats are now closed with a continuous suture The whole is now inverted with a Lembert stitch As there is no fear of stricture the inversion is made deeper than usual and for that reason the stitching is more secure and safer I will close the abdomen in the usual manner

Dr Edmund suggests that such a structure as this would seem to have a congenital origin The lack of any scar tissue in the neighborhood and the fact that the outer walls were not a part of the stricture tend he says to support this view He suggests the possible parallel with the multilocular stomach of ruminants and the midgastric sphincter which has recently been described by certain physiologists It seems to me that there may be some such significance to these cases The ileo cecal valve is mainly a fold of mucosa as are the valves in the rectum



## ENDOTHELIOMA OF THE BRAIN AND MENINGES    WIDE REMOVAL BY BLOCK DISSECTION

Patient Presenting Tumor of the Brain Resembling Pott's  
'Puffy Tumor' of the Scalp    Operation Revealed Basal cell  
Endothelioma of Dural Origin    Technic of Removal by Block  
Dissection

My purpose in showing this case and specimen is to illustrate the principle of block dissection and wide removal in brain surgery and to urge its superiority over mere enucleation. This is no more than an axiom in all malignant growths but a radical operation on a tumor within the skull is seldom as easy as in other organs which probably explains often the unsatisfactory results following their removal. In some degree this is inevitable and to some extent it is capable of improvement.

The end result of a fairly large series of brain tumors removed by me in the past ten years has shown an unpleasant proportion of failures. Although the operative deaths have been few the permanent cures have also been few. Both in my own and my colleagues' cases there have been a bad and large percentage of recurrences and of postoperative epilepsy.

I am trying of late to do more radical operations removing a zone of adjacent tissue which I can best illustrate by showing the tumors themselves as they appeared after removal. That this is always going to be possible as it is in breast carcinoma I do not contend but it may be a direction toward which we may look in brain surgery of the future.

This is only one of the factors in future improvement. The other factors are earlier diagnosis and more accurate localization.

Progress in these directions is sure to go on as our experience and pathologic knowledge enlarges. When I recall in my own and other clinics the many cases of brain tumor cut down upon only to find them impossible of removal from extensive adhesions early metastasis or incurable paralysis already established it

is difficult to avoid pessimism toward the reported work of the best specialists. If we grow optimistic as a result of a few successful cases our optimism is apt to receive a severe shock when we see the cold statistical tables of end results.

If any brighter future is ahead it will be found in a combination of more radical block removal of segments of brain tissue which in turn can only be possible when earlier diagnosis has been achieved by the researches of the pathologist and the neurologist and through them the general practitioners.

It is the same story repeated of the appendix or the perforating ulcer only the problem is more difficult because early diagnosis is often impossible.

The case before us which was one of large brain tumor of the occipital region was invading the cortex, dura and bone and scalp block dissection meant removal of the tumor itself with a layer of normal brain both tables of the skull and the overlying pericranium and occipitofrontalis and scalp. The principles involved were exactly those of say a breast amputation where we excise with the growth the adjacent muscle skin and fascia in a block dissection. This is a difficult thing in the brain and yet this was for once relatively easy instead of being as in so many cases impossible of execution the only obstacle was a matter of dealing with large vessels of the deep sulci which however lent themselves fairly well to ligation being in the apex of an open wound formed by removal of a convolution. In a former paper I described certain angiomas which I was able to remove only by destroying with the hot iron and then only in two stages and at some risk of destroying too much or too little. Here the work was relatively safe and easy the meningeal vessels being easily controlled and those of the arachnoid almost as easily while Horsley's wax was a good hemostatic in the diploe.

The patient a man of sixty four came to our clinic from Philadelphia where however a diagnosis had not been made. A persistent one sided occipital headache was his most important symptom. I found no retinal changes and this was confirmed by a competent ophthalmologist neither were there any focal symptoms. A radiogram showed no tumor shadow but a

slight thinning or atrophy of a disk of bone over the occipital lobes about 4 to 5 cm in diameter with a corresponding bulge or thickening of the scalp or pericranium This resembled the condition formerly called Pott's puffy tumor of the scalp but was in my opinion indicative of malignancy rather than osteomyelitis

I therefore advised radical operation and planned the work so as to include wide extirpation namely of the bone and scalp the tumor itself within and a layer of brain tissue enclosing it To execute this a horseshoe flap was raised and the overlying occipitofrontals excised with the bone flap 5 by 6 cm in size As was anticipated the tumor was continuous from within through both tables of the skull pericranium and muscle and in fact approached the hairy scalp so that a circular piece of it was also lost Internally the growth was spheric lying within the occipital lobe was about 4 cm in a globular form and of firm consistence

No great difficulty attended its removal except that especial care was taken to remove a shell of brain tissue  $\frac{1}{2}$  cm enclosing it and also a circle of normal dura and normal bone around it all of which you see in the specimen and photograph

This involved tying certain vessels of the pia and dura which were not hard to find in the large wound No effort was made to close the dura or skull defect which might have been done by bone and fascial transplants as we preferred to postpone this plastic work until after a course of radiotherapy

The tumor which I show here is an exceedingly good example of the basal cell endothelioma of the dural origin so well described by Mallory Cushing and I think Frazier and others

While I have done no original work on it and realize that some of the more recent study on this special tumor may have escaped my attention I think we are agreed that endotheliomata are best classified by comparing normal tissue for example fibromata to fibroblasts gliomata to glioblasts The so-called dural endotheliomata are not always so classified but on the basis of their location As you will see in these slides they are characterized by whorls and by palisade arrangement of the



palisaded arrangement of the nuclei in parallel columns is typical. Cells in mitosis are easily found in every field.

Collogen is abundant in the stroma and the stroma in the dura show numerous invasions. We also see mitotic figures, arachnoid villi and pacchionian bodies.

**Comment**—Brain tumor operations are an exception to usual rule in surgery of malignancy in that we do not attempt *block dissection*.

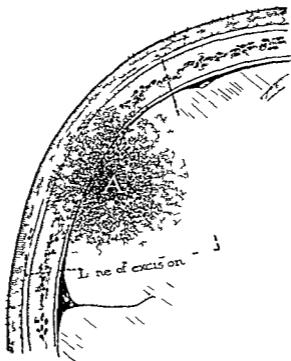


Fig. 401.—Drawing showing outline of flap and section removed at operation.  
A. Tumor mass.

No distinction has been made between *radical* and *palliative* because any kind of removal was a triumph of modern surgery. *Enucleation* was the rule, leaving a capsule bed. In any other part of the body this would be called a *palliative* operation.

Safety and conservatism demand a compromise. No more brilliant chapter has been written in modern science than the epic on brain and cord surgery, yet we may see vistas of further advance when we have widened the field to include some old surgical principles now excluded.

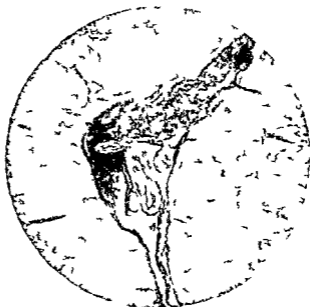


Fig. 40.—Microphotograph of tooth fragment. Magnification 60 diameters.

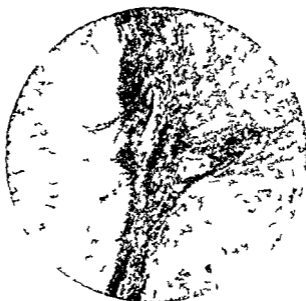


Fig. 403.—Microphotograph of tooth fragment. Magnification 80 diameters.

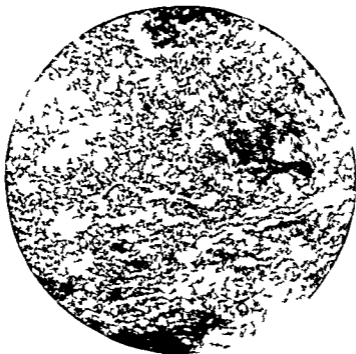


Fig 401—Microphotograph of section of tumor      Magnification 130 diam  
eters

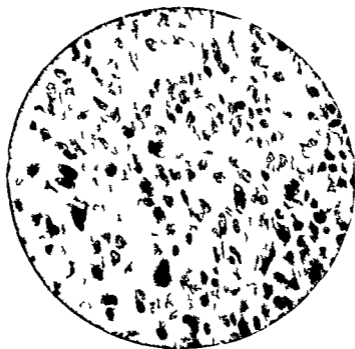


Fig 405—Microphotograph of section of tumor      Magnification 560 diam  
eters.

One of these is the principle of block or massive removal of tumors. Perhaps this can never be done. Possibly in the cord and certain deep tracts of the brain the prospect is hopeless, but other parts do offer the chance.

I have been able to do this more commonly and even more radically than I at first hoped. Now I know that this work must be a progressive development. We enlarge little by little the work as it proves its success slowly in the best clinics of the world.

New roads can only be built as branches of old ones. Horsley long ago showed us that whole convolutions could be excised at the cortex. I can and do take one or two, and with a glioma instead of enucleating it. The vessels in pia or dura, the membranes themselves, the falx or tentorium, the dura bone, pericranium, or scalp can be included in block removal, as you see in one of these specimens. On the whole, experience confirms my faith in the value of this idea. I have no desire to criticize the older methods. I have nothing but admiration for the splendid evolution of brain tumor surgery. This brilliant scientific leadership is all that has made our later work possible. Many of the difficulties are inherent, but I think those specimens prove that block dissection and mass removal is sometimes possible.

As I work toward this goal it proves less difficult than I feared. Progress will depend, as Prazier so well says, upon early diagnosis and localization more than upon new methods of operation. The earlier and smaller a neoplasm is found, the more it lends itself to an excision. I believe this will be the future method of clinics.

## CLINIC OF DR DAVID C STRAUS

### COOK COUNTY HOSPITAL

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#### SUBPHRENIC ABSCESS    TRANSPLEURAL DRAINAGE UNDER PARAVERTEBRAL ANESTHESIA

A MAN seventy two years of age entered the hospital because of pain and tenderness in the right hypochondrium that came on relatively suddenly two days before admission accompanied by a visible and palpable tumor in that region. He had been operated upon three months previously for ruptured appendix wound drained up to six weeks before admission. Examination disclosed a right subphrenic abscess. It was believed the painful mass that suddenly appeared beneath the right costal margin was due to pointing of the subphrenic abscess. Incision under general ether anesthesia. Subsequent course and Roentgen examination showed that this was a separate abscess limited to the abdominal wall and not connected with the subphrenic collection. Four days later the subphrenic abscess was drained under paravertebral anesthesia by subperiosteal resection of 10 cm of the ninth and tenth ribs in the posterior axillary line *i e* transpleurally. Recovery. Technic of paravertebral anesthesia in operations on the diaphragm and liver.

W P Cook County Hospital No 789459 male seventy two years of age was admitted to my service February 25 1922. He complained of pain and tenderness in the right hypochondrium and a palpable swelling just below the right costal arch and stated that these symptoms had come on relatively suddenly two days previously.

In November 1921 he had been operated upon for a ruptured appendix the wound had drained for some time then healed but later the wound reopened discharging pus. This grad



F g 406—R tg g m h w g ght bph bsc se d ry  
 t pt d ppe d pe t d p th m th b f dm  
 Th how th t th ght d f th d phragm lly hgh h g  
 th v th b The c pl m g l th mal epe lly t  
 l t l p t th m t t k g feat th lm t t l d t of  
 th o t t mty f th d ph gm o th t th t d ph gm t gl  
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 xamnat h w d th t th h lf f th d ph gm w mm bl (P t n  
 of p ct d n p nt g)

ually subsided and the wound again healed up about six weeks before he came to the hospital but since then he had occasional

sore spots in the right side' Two days before entering the hospital he began to have pain tenderness and a swelling in the right upper quadrant of the abdomen just below the costal margin He had had no chills and, so far as he was aware no fever He stated that his appetite was good bowels were regular and that he slept well Previous history was otherwise negative except that he had lost a great deal of weight since November

**Physical Examination**—The patient a poorly nourished white male looked his age and did not appear acutely ill but seemed weak His color was slightly yellowish Examination



Fig 407—Photograph of patient immediately before operation This shows that the abdomen is flat except in the right upper quadrant immediately below the costal margin where there was a large smooth circumscribed hard very tender swelling A shows the location of this abscess The lines on the photograph show the upper and lower margins of liver dulness

of the head and neck showed nothing of interest Examination of the chest showed nothing of interest except for an abnormal dulness in the right lower chest posteriorly a continuation upward of the area of liver dulness corresponding to the upper border of the shadow seen in the roentgenogram (Fig 406)

The essential pathologic findings were in the abdomen The abdomen was soft flat and skin lax everywhere except in the right upper quadrant just beneath the costal margin Here there was a large smooth circumscribed hard very tender swelling (Fig 407) The skin over it was not discolored and there was

no fluctuation. There was a large incisional hernia in the old right rectus appendectomy incision but no tenderness or evidence of existing infection in adjoining portion of the abdominal wall or the immediate neighborhood.

The demonstrable pathology was limited to the right upper quadrant of the abdomen. The afternoon temperature was 99° F, pulse 96 and of fair quality and respirations 24. He seemed very weak. A blood examination showed Leukocyte count 16,200, hemoglobin 80 per cent, erythrocytes 4,800,000. The differential count showed polymorphonuclear neutrophils 80 per cent, small mononuclears 15 per cent, large mononuclears 4 per cent, and eosinophils 1 per cent. Urinalysis showed color amber, specific gravity 1.026, reaction acid, no albumin, no sugar, microscopic examination negative.

A diagnosis was made of right subphrenic abscess secondary to the old ruptured appendix and from the history and the physical findings it was believed that the sudden swelling, pain and tenderness beneath the right costal margin was due to pointing of the subphrenic collection at this point.

To confirm the diagnosis of right subphrenic abscess the patient was ordered to the roentgenologic department for fluoroscopic and plate examination. The report reads: The right diaphragm is unusually high, higher in outer extremity. The costodiaphragmatic angle of this side is about 90 degrees. Fluoroscopic examination shows very little mobility of same. This accords with the clinical diagnosis of subphrenic abscess. The roentgenogram (Fig. 406) is typical of subphrenic abscess, the striking finding on the plate being the unusual height of the diaphragm and the steep rise in addition to the abnormal height at the costodiaphragmatic angle. Thus together with the fact that this portion of the diaphragm is essentially immobile is typical of subphrenic abscess. In liver abscess while the height and contour may be similar, the costodiaphragmatic angle is ordinarily not so steep and what is even more important, the diaphragm often is not immobile. As the differential diagnosis, etiology and treatment of subphrenic abscess was

discussed in detail in a former clinic<sup>1</sup> these will not be gone into further at this time

Having confirmed the diagnosis of subphrenic abscess operation was arranged for

**Operation**—The patient was operated under general ether anesthesia February 28 1922 Although I ordinarily prefer to attack a right subphrenic abscess by the transpleural route through an incision in the right posterior axillary line as described in a recent clinic<sup>2</sup> it may be indicated to approach the abscess by some other route or incision in a particular case depending on the findings as was discussed in that clinic In this case as the prominent tender swelling presenting immediately beneath the right costal margin anteriorly led me to believe that the subphrenic collection was pointing here I decided to make my initial incision over this mass and continue the operation as the findings indicated It is unusual to approach a subphrenic abscess by the anterior route and a lateral or posterior route is in general preferable But if the abscess is pointing anteriorly and causes a bulging which threatens to perforate anteriorly this presents an indication to go in anteriorly

With the patient lying on his back in the ordinary dorsal position I made a small incision through the skin parallel to the costal margin and over the long axis of the center of the swelling just below the costal margin (Fig 407) The anterior sheath of the right rectus muscle was next incised The fibers of the right rectus muscle were then separated and when this was done the abscess was opened and thick pus escaped Introducing the right index finger it was impossible to determine whether or not there was any communication between this pus collection and the subphrenic abscess Realizing that it might or might not be in communication with the subphrenic collection I deemed it unwise to do more than insert a drain and await

<sup>1</sup> Straus David C Subdaphragmatic Abscess Transpleural Drainage of a Case Due to Abscess of Liver *Surgical Clinics of Chicago* 4 377 April 1920

<sup>2</sup> *Ib id*

results. If there were a free communication even though not large I thought ample drainage might result. On the other hand if this by any chance were a separate abscess I did not care to take the great risk of infecting the general peritoneal cavity by entering the abdomen through this infected field. Consequently I inserted a large iodoform gauze drain into this



Fig. 403.—Photograph of patient taken after the operation. The photograph shows the ideal scar of the incision made to drain the perforated appendix which was the cause of the abscess. The operation was performed three months before admission to the hospital. It also shows the scar made at the first operation and kept open to drain the dependent abscess from the retroperitoneal wall.

cavity to hold the walls apart and completed the operation by merely applying a dry dressing.

Although the entire procedure took but twenty minutes he stood the interference poorly and his condition was not good. His pulse and respiration had risen from 86 and 24 to 158 and 40 the pulse being weak and the respirations abdominal. Under ordinary shock treatment his condition improved and by 7

P M the pulse was 88 and respirations 24 again. His temperature that evening was 98.6 F. the following day (March 1st) did not rise above 99° F. on the 2d reached 99.4° F. as the highest and on the 3d only once was recorded as over 100° F. The pulse remained between 80 and 100 usually being about 90 and respirations between 20 and 30, usually about 24. Physical examination of the chest showed no change in the area of abnormal dullness and there was but little discharge from the drainage opening. It seemed perfectly clear now that the abscess we had drained did not communicate with the subphrenic abscess. To corroborate our findings the patient was sent to the roentgenologic department for another roentgenogram on March 3d. The plate showed no change had occurred since the operation (Fig 406). Similarly the leukocyte count had not decreased. On February 27th the day before the operation it was 16,600. on March 1st, the day following the operation it fell but slightly 15,800 but on March 3d the day the roentgenogram was taken it had risen to 17,800 or the highest it had been. As it was obvious that the subphrenic abscess was still undrained I decided to attack it the following morning.

**Second Operation Transpleural Drainage of Right Subphrenic Abscess (March 4, 1922) Under Paravertebral Anesthesia**—Considering the fact that the patient had had a general ether anesthesia only four days before it seemed unwise to give him a general anesthetic again so soon. Furthermore he had taken the anesthetic badly. For this reason I decided to employ paravertebral anesthesia. I carried out in a general way the technic as outlined by Pauchet Sourdats and Labat,<sup>1</sup> as later slightly modified by Labat which has subsequently been published.<sup>2</sup>

The patient having been given a hypodermic injection of morphin sulphate gr  $\frac{1}{4}$  with atropin sulphate gr 1/150, half an hour before bringing him to the operating room was placed

<sup>1</sup> Pauchet Sourdats and Labat. *L'Anesthesie Regionale*. 11<sup>e</sup> edition. Paris. Librairie Octave Doin. Gaston Doin Editeurs. 1921.

<sup>2</sup> Labat Gaston. *Regional Anesthesia*. W. B. Saunders Co. Philadelphia and London. 1922.

on the table so that he lay on his left side (the healthy side) with his back arched thighs flexed knees drawn upward in strong flexion and head bent forward so as to widen the intercostal and intervertebral spaces as much as possible just as is done in making a lumbar puncture and a sand bag was placed under his loin in order to straighten the vertebral column in a sagittal plane (Fig 409) The operative field was prepared in the ordinary manner

In planning the details of paravertebral anesthesia for a particular operation one has to consider the nerve supply to the tissue and organs that are to be attacked In operations on the diaphragm the terminal fibers of the phrenic nerve have to be blocked for these supply both the superior and inferior surface of the diaphragm with sensory fibers These can be blocked by infiltrating the diaphragm after it is exposed or can be blocked paravertebrally by blocking its roots near their origin The phrenic nerve arises essentially from the  $C_4$  with anastomoses from the  $C_3$  and  $C_5$  The surest location to block it in the neck is above the transverse process of the fifth cervical vertebra Only the peripheral portion of the diaphragm gets its sensory innervation from the intercostal nerves and for this reason a mere blocking of the intercostal nerves suffices only to secure anesthesia of the periphery of the diaphragm

In this patient I decided to block the diaphragm by direct injection after I had exposed it As I planned to resect a portion of the ninth and tenth ribs it was essential to block not only the ninth tenth eleventh and twelfth dorsal nerves but in addition the eighth dorsal and the first lumbar for we know it is impossible to obtain complete anesthesia of any particular intercostal space unless the intercostal nerve immediately above it and the intercostal nerve immediately below it are also blocked for the cutaneous branches of the adjacent nerves overlap the intercostal space supplied by that nerve

The twelfth rib was palpated and the spinous process of the twelfth dorsal vertebra located by Labat's method by dropping a line from the twelfth rib vertically to the line of the spinous processes at a point on the twelfth rib where this vertical line

measures 5 cm to the line of the spinous processes (Fig 409) The other spinous processes are counted from this one

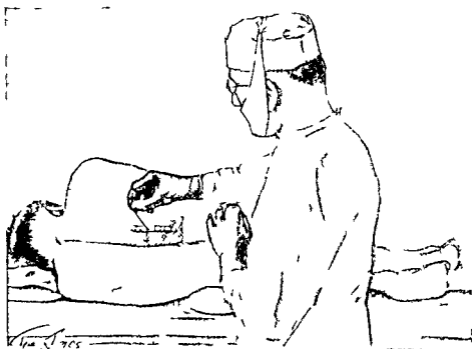


Fig 409—Drawing (modified after Pauchet Sourdat and Labat and after Labat) The patient lies on his healthy side with his back arched thighs flexed knees drawn upward in strong flexion and head bent forward so as to widen the intercostal and intervertebral spaces as much as possible just as is done in making a lumbar puncture and a sand bag is placed under the loin in order to straighten the vertebral column in a sagittal plane The twelfth rib is located by palpation The spinous process of the twelfth dorsal vertebra is located by Labat's method by dropping a line from the twelfth rib vertically to the line of the spinous processes at a point on the twelfth rib where this vertical line measures 5 cm to the line of the spinous processes The other spinous processes are counted from this one The skin is injected intradermally along a line 4 cm from and parallel to the line of the spinous processes Each paravertebral injection is made at a distance of 4 cm from the line of the spinous processes The illustration shows the final direction of the needle which is inserted downward at an angle of 45 degrees and inward at an angle of 45 degrees (Fig 410 shows the deep relations of the needle in its course)

The tips of the spinous processes of the first to sixth dorsal vertebrae lie approximately at the level of the intertransverse spaces bounded by the two next lower vertebrae that is at the

level of the next lower nerve. For example, the spinous process of the first to sixth dorsal vertebrae correspond to the second to seventh dorsal nerves. But as the lower dorsal spinous processes have a more oblique course and are longer, the tips of these lower spinous processes lie opposite the lower portion of the corresponding intertransverse spaces. However, there are variations, and when the transverse processes are very long, the tip may even reach the next lower interspace. In every case, however, the field is tested after making the injections, and if the blocked area does not prove sufficiently wide for the intended operation, or if one of the nerves has not been reached by the anesthetic fluid, supplementary injections are made.

Next, using a centimeter ruler that had been boiled up with the instruments, a point 4 cm. from the sixth spinous process was marked on the right side of the spinous process, and similarly a point 4 cm. from the right of first lumbar vertebra, and a line drawn connecting the two points, and this line 4 cm. from and parallel to the line of the spinous processes was blocked *intradermically* by a series of overlapping wheals using a long needle so as to limit the number of reinsertions as much as possible. The appearance of the line of infiltration if properly performed has the appearance of goose flesh, or as the French have called it, *peau d'orange* (orange skin). The essential point is that this injection should be made within the skin and not subcutaneously.

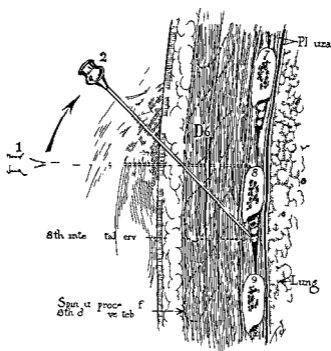
Next, each of the nerves, eighth dorsal to first lumbar inclusive, is injected in the following manner. A fine needle, 8 cm. long and with a hub (the portion that fits the syringe) that fits either a Luer or Record 10 c.c. syringe, is grasped by its hub, and the shaft of the needle directed so that its point pierces the *peau d'orange* 4 cm. from the median line at the level of the rib immediately above spinous process of the sixth dorsal vertebra, i.e., the eighth rib, and introducing the needle perpendicularly to the skin and so that it will impinge upon the superior border of the rib (Fig. 409). If the point of the needle does not strike the rib at this portion, or does not strike the rib at all, it is not necessary to withdraw the needle completely and

pass it through another point of entrance but merely to withdraw it until its point lies in the subcutaneous tissue, and then by displacing the skin upward or downward the point of the needle is made to lie over the upper margin of the rib. When the point of the needle is felt to have come in contact with the rib the needle is withdrawn slightly in order to change its direction.

Next the hub of the needle is swung outward and upward so that now the needle is pointing downward at an angle of 45 degrees and inward at an angle of 45 degrees (Fig 410). The needle is now slowly inserted at this angle and its point again advanced until it strikes the lower border of the rib. When the needle point is felt to have progressed until it just passes beneath the lower border of the rib taking care to maintain the same direction with the needle it is advanced 2 cm further and here is stopped. In this position the point of the needle has passed downward inward and forward obliquely across the intercostal space and lies at a point equally distant from the two ribs  $\pm c$  in the midpoint of the intercostal space and lies within the intercostal muscles about 1 cm anterior to the transverse process and in relation to the point where the anterior primary division gives off the ramus communicans to the sympathetic system (Fig 410).

There are several reasons why it is advisable and desirable to pass the needle before it is attached to the syringe. In the upper thoracic region occasionally cerebrospinal fluid comes out through the needle. Labat has explained this as probably being due to an abnormal prolongation of the subarachnoid culdesac accompanying the nerve beyond the intervertebral foramen. If cerebrospinal fluid does escape through the needle the needle is slowly withdrawn until this no longer continues as it is not desired to inject the anesthetic intraspinally. The chief reason for introducing the needle unattached to the syringe however is to give notice in case the needle punctures an intercostal blood vessel. Should this occur blood escapes from the needle. The needle should be withdrawn slowly until the flow of blood ceases and then the direction of the needle is changed slightly. The small amount of blood that escapes into

the tissues is of no importance. It is highly important however that the novocain solution be not injected directly into the



Fg 410—D w g (ft P h t So d t d Lal t) Sh w g th  
 t h f t d c g th d l n y g t p r t b l th a n  
 p t g b p h b s c Th d l s e t d p p d l ly  
 t th l u n t p t 4 c m l t l t th p o p s s f th th  
 v i c a l t b d v d u t i l t p t m p g th p p e m g n f  
 th g h th b th d l th n w t h d w p r t l l y t l t d c t n  
 b e h g d N t th h b f th n d l w g t w d d p w d s o  
 th t n w th d l p o t g d w w d t g l f 45 d g r d  
 w d t g l f 45 d g r s o th t th p t f th d l w h w  
 d v d p b e l w t h l w m a g f th g h th b M t g th  
 b l q t y o f 45 d g r t t d 2 m f th s o th t t p o t m t  
 l th m d d l f th t e t l p t p o t b o t l m t t th  
 t p d th m m d t t y f th g h th t s t l  
 r v t th p o t w h th m m m g v f f t th y m  
 p th t y t m

blood stream. If the needle pierces the parietal pleura this causes a sudden sharp pain and if the needle enters the lung

blood may escape from the needle. The puncture of the pleura or lung is of no importance but if the novocain is injected unintentionally the operator is made aware of this fact by the symptoms produced. If the fluid is injected into the pleural cavity the patient coughs; if injected into the lung the patient experiences a bitter taste but in either case there is no cause for worry. However it is for this reason that the fluid should be injected very slowly especially when beginning each injection.

Being satisfied that the position of the needle is correct the syringe filled with 1 per cent novocain adrenalin solution (15 drops of a 1:1000 adrenalin solution are added to every 100 c c of freshly prepared 1 per cent novocain solution) and 5 to 6 c c of this solution are slowly injected half of the amount is injected without moving the point of the needle and the remaining half is injected while the needle is slowly withdrawn but before the point of the needle reaches the lower margin of the rib.

Each of the nerves is anesthetized in exactly the same manner. The anesthesia that results extends anteriorly to within about 1 inch of the median line.

When the anesthesia was complete an incision about 13 cm long was made over the ninth rib on the right side extending anteriorly to the posterior axillary line the incision going right down to the rib. About 10 cm of this rib was resected subperiosteally and then the same length of the tenth rib was similarly resected. It was found that the visceral pleura was adherent to the parietal pleura. Had this not been the case I planned to cause such adhesions to form by packing in iodoform gauze forcing the parietal pleura against the visceral pleura and then waiting twenty four to forty eight hours before incising so that the free pleural cavity would be walled off by adhesions. As however firm adhesions were present and no respiratory mobility of the lung could be made out I made a small incision through the parietal pleura the visceral pleura and the diaphragm all of which were fused together and thickened and at once thick mucus escaped. This was not al

lowed to escape rapidly. When the pressure had been reduced the incision through the diaphragm (Fig 411) was extended the entire distance that the ribs had been resected in order to get very free drainage. About 1000 c.c. of pus came away. When pus no longer escaped the large cavity was irrigated with sterile normal saline solution until the fluid returned clear. Then two large rubber drainage tubes were introduced and held in place by suturing each to the skin by a single silkworm gut suture and two Dakin tubes were introduced one at either ex-



Fig 411.—Photograph of patient taken after the wound was properly closed. The large rubber drainage tube and Dakin tube are in place.

tremity of the incision through the diaphragm to be used after twenty-four hours for Dakinization of the cavity. The skin incision was closed by means of two silkworm gut sutures one near either extremity of the skin incision (Fig 411) and copious dry dressings were applied.

The case presents two instructive features. First the patient presented two independent abscesses each of which required a separate incision for proper drainage. Second and perhaps the more interesting point is that the patient withstood the minor

operation badly under general anesthesia whereas he stood the more extensive and longer operation very well under paravertebral anesthesia. Following the first operation in which ether was administered for only twenty minutes and in which merely an incision was made into the abscess of the abdominal wall without entering the peritoneal cavity the pulse at the end of the operation had risen from 86 to 158 and respirations from 24 to 40 whereas after this second operation which was performed under paravertebral anesthesia and was very much more extensive lasting one hour and fifteen minutes the pulse which was 80 before the operation only rose to 118 and the respirations from 26 to 30. This is conclusive evidence that the patient suffered no pain.

The abscess cavity was irrigated with Dakin's solution every two hours daily until the discharge was slight. Recovery was uneventful. The patient was allowed to be up in a wheel chair on March 15th (eleven days after the subphrenic abscess was drained) was able to be up and about the ward March 25th (three weeks after the operation), and was discharged on April 17th cured.





general surgeon has worked hand in hand with a great tuberculosis specialist because this combination guarantees the four most essential elements (1) proper selection of cases (2) proper preliminary treatment (3) careful conservative operative treatment and (4) intelligent after treatment

**History of Case**—Date June 28 1921 Name Mr H A W Age forty one

*Nationality*—American

*Occupation*—Previous to twelve years ago operated a calendar machine in rubber factory which was dusty and poorly ventilated He quit this and went into real estate because of injury to the left arm and elbow

*Family History*—Maternal aunt died of tuberculosis

*Marital*—Married fifteen years Wife and 3 children living and well One child died at two of typhoid and tuberculous meningitis One child died of endocarditis One miscarriage before first child

*Operations*—Appendectomy 1916 for acute attack

*Habits*—No alcohol or tobacco Before present illness moderate smoker

*Previous Illnesses*—Measles mumps whooping cough and chickenpox in childhood Abscess of left ear following influenza in 1918

*Head eyes nose teeth throat and gastro intestinal* negative

*Rectal*—Two and a half years ago had an abscess at side of rectum This subsided leaving a fistula which is not painful and which oozes a few drops of thin gray fluid each day

*Venereal*—Negative

*Neuromuscular*—Negative

*Present Illness*—Sixteen years ago the patient had a cough with pain in the right side of the chest and night sweats and was run down After about one year he had recovered from this and was well until he had influenza in October 1918 Immediately after this he had pneumonia and was dangerously ill for three weeks Ever since he has had a cough very slight chest pains on the right sweating during sleep afternoon flushing and malaise and he has remained in a run down condition

and is very easily exhausted During this time he has had thirty five pulmonary hemorrhages and countless minor ones Last hemorrhage occurred December 1920 He raises very little sputum sometimes foul smelling Tubercle bacilli frequently found Two years ago went to Arizona for treatment and returned to Akron Ohio June 15 1921 Gained 30 pounds in Arizona but has in last two months lost 10 or 12 pounds The left lung has been repeatedly pronounced healthy on physical examinations

*Physical Examinations*—Well developed and fairly well nourished Color good Skin clear

*Head nose teeth and throat* negative

*Eyes*—Pupils equal and react but are widely dilated

*Ears*—Negative to external examination save for slight impairment of hearing on the left side

*Chest*—Sunken below right clavicle Right side of chest moves less than the left Respirations 24 per minute

*Lungs*—Right lung dull to flat everywhere with increased vocal and tactile fremitus Breathing is everywhere bronchial in type and in the region of lower angle of scapula breathing is amphoric with positive 'cracked pot' sound No rales over the upper portion of lung but there are fine numerous rales at the base

*Left Lung*—Apparently free and negative to inspection palpation percussion and auscultation

*Heart*—The heart lies entirely to the right of the midsternal line and its borders cannot be outlined Sounds of good quality and rhythm Rate 96 per minute No murmurs

*Vessels* not thickened Tension not increased

*Abdomen*—Appendectomy scar No masses tenderness or herniæ Spleen kidneys and liver not felt

*Genitalia*—Negative Left testicle normally lower than the right Both testicles and epididymi negative

*Rectal*—Small fistula on right side with moderate induration

*Extremities*—Clubbing of fingers Otherwise negative

*Reflexes*—Lively and equal on the two sides

*Urine*—Negative

*Sputum* — Examination positive (+ +) for tubercle bacilli  
No odor or blood

*Wassermann* — Blood negative

*X Ray of Chest* — *Right lung* completely diseased and apparently solid throughout save for a shadow suggesting cavity near lower angle of scapula

*Left lung* shows fine mottling here and there but no definite area of consolidation or calcation

The *heart* lies entirely to the right of median line

*Diagnosis* — Pulmonary tuberculosis right side with cavity  
Displacement of heart to right    Fistula in ano

Figure 414 shows the left lung practically normal

*Operative Notes* (July 1 1921) — Resection of sixth to eleventh ribs  $\frac{1}{4}$  gr morphin and 1/100 gr of atropin one hour before operation and  $\frac{1}{8}$  gr of morphin and 1/150 gr of atropin just before operation have rendered the patient drowsy and indifferent to everything save pain

*Local anesthesia* with blocking of intercostal nerves using per cent apothecine solution The technic is as follows First we inject the skin along a strip parallel to the spine and with its center line 2 inches from the spinous processes The width of the strip injected should be  $1\frac{1}{2}$  to 2 inches and its length should extend from below the twelfth rib to several inches above the fifth rib Next comes the blocking of the intercostal nerves which is done by starting with the lowest intercostal space and proceeding to the next above and so on Through the skin which has already been injected a long needle is inserted till it strikes the rib then the needle is tilted and its point made to seek out the lower edge of the rib where the intercostal nerve lies and here 5 cc of the solution are injected it is well to slightly withdraw the needle and to again seek to inject the nerve at a point either medial or lateralward to the first indeed to insure anesthesia each nerve should be injected at least at three separate points which is possible to do by angling the needle and thus without piercing the skin each time One of these three injections should reach medianward as far as possible and here it must be remembered that the

nerve lies halfway between the ribs rather than just below the lower margin as shown in Fig 412. When an intercostal nerve has been injected it is well to leave the needle *in situ* and before removing it to seek the next rib and nerve with another needle. During the operation we may or may not have to infiltrate one of the nerves again. We make it a rule to infiltrate two nerves above the limit of the first stage operation.

*The Operation*—A sweeping longitudinal incision is made along the center line of the infiltrated skin. It is carried down to the ribs. The many cut and bleeding vessels are caught

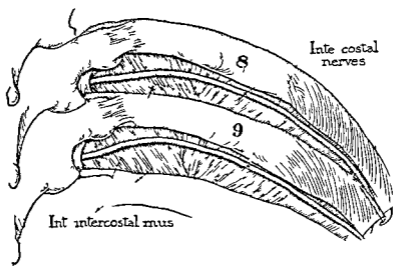


Fig 412—Location of intercostal nerves. Note relation of nerve to lower margin of rib.

with hemostats as we go for these patients should not be allowed to lose much blood. We are now down to the ribs and the patient has so far experienced no pain. Next the periosteum is loosened from all of the ribs which are to be resected, namely the eleventh to the fifth ribs inclusive. In so doing we must be careful to avoid injuring the pleura. If the pleura should be pierced the hole may be stopped by pressure with gauze with or without sterile vaselin as the case may require and later sutured. Should the patient cough during the operation thereby bulging out and endangering his pleura we simply exert pressure with gauze and request the patient to cough. After several

attempts he cannot cough if he wishes to and we can proceed without trouble. During the stripping of the seventh rib the patient shows slight pain so we will infiltrate the nerve again. The ribs are all ready for resection. We start at the lowest and with the special rib scissors (Fig 413) resect 10 cm and quickly proceed to the next rib and so on taking slightly shorter lengths each time. As each rib section is removed the

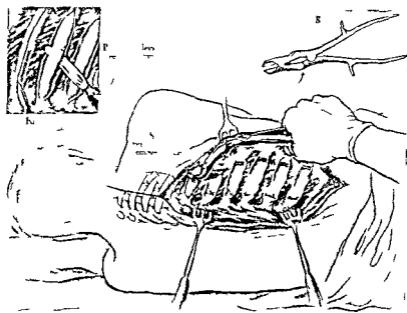


Fig 413—Resection of the seventh rib—the first stage of the operation. A Rib completely stripped of periosteum. B Flap of pleura. Rib cutted guided by P. f. sso. E. Key of Stockholm. Note double lig.

exposed pleura is covered with a large pad of gauze under slight pressure. We stop at the sixth. Ligatures are applied and a long split rubber drain laid in the wound. Over the drain muscle and fascia are closed. The drain is brought out through the lower end of the wound and the skin is closed with catgut. Two layers of gauze are placed over the wound and with wide strips of adhesive which encircle the chest entirely the latter is

securely strapped so as to collapse the right side. The straps are left undisturbed for several weeks, the drain being simply pulled out from below the lower end of the dressing at the end of a week. The skin stitches, being catgut, require no attention. The strapping of the chest is important, for if it is done shiftlessly the results of the operation will not be up to expectation. The patient is held in a sitting position with arms partially abducted; then the straps are securely applied after expiration. The right side is thus held in collapse.

The operation seems so easy to do that one is always tempted to do the whole affair in one stage. Experience has taught us, however, that this is dangerous, so that we always employ two stages, no matter how tempted we are to continue during the first stage. The patient now is in excellent condition. Were we to continue he might not survive because the total of shock would be too great. He will be sent to his room as he is. The head of his bed will be elevated 18 inches to prevent hypostatic pulmonary congestion. He can begin at once to take large quantities of water, this being another advantage of the local anesthetic. He will be given urotropin, 5 grains every two hours, dissolved in a glass of cold water. His feeding will be forced, of wholesome food best suited for tuberculous patients. Later, when his condition warrants, we shall resect the remaining ribs.

*August 2, 1921. Clinical Notes*—Following the first stage operation the patient had moderate fever for a week and a half. Since then his temperature has been normal. The wound is perfectly healed. The heart functions well, and the left lung continues to be negative to physical examination.

*August 3, 1921. Resection of Fifth, Fourth, Third, and Second Ribs*—The anesthesia is accomplished in the same manner as during the first stage. First a strip of skin is injected parallel to and  $2\frac{1}{2}$  inches distant from the spinous processes.  $\frac{1}{2}$  per cent solution of procain is used. Next the intercostal nerves are injected from the sixth to first inclusive. As during the first stage operation the nerves are reached just at the under edge of each rib. The incision is made extending from

the fresh scar to the first rib. It is carried down to the fourth third and second ribs which are stripped of perosteum and from which are resected portions varying respectively from 6 to 4 cm in length. Closure and drainage and strapping are carried out as described under the first stage. The postoperative care will also be the same.



Fig 414—Ch t plat f ca r port d ft th t o-tag pe t  
N t b e of h rt o l ft d The po t n of th ght b poste rly  
after th ll pse can be se

*September 15 1921*—Since the second stage of the operation the patient has done well. He has been able to be up and is fever free. He does not cough and his sputum only occasionally shows a few tubercle bacilli. He has gained in weight and feels well though still tiring easily.

The heart still lies to the right. It functions well and the left lung remains negative.

The x ray (Fig 414) shows the collapsing effect of the

operation on the right side and the effect on the cavity near the lower angle of the scapula

The patient is discharged much improved, and advised to return to Arizona

*January 1 1923*—At Christmas 1922 patient is still improved and has held an 8 pound increase in weight No mention is made of sputum or hemorrhages He writes from Arizona

There are certain important details which must be borne in mind in connection with this form of treatment in order not to do harm to the patient

1 *Selection of Cases*—(a) The patient must have one lung in a fairly normal condition because if this is not the case the disease will make very rapid progress following the operation and the patient's life is likely to be shortened

(b) The patient's general condition should be such as to insure a fair amount of resistance against the shock of the operation

(c) The patient should belong to a class in which efficient gas compression cannot be accomplished

(d) The patient should be as nearly free from fever as possible

(e) He should be accustomed to the bed by being kept in the recumbent position for a number of days before the operation

(f) The condition of both lungs should be carefully studied by physical examination and by the study of well made x ray plates

2 *Anesthetic*—The anesthetic should be preceded by the hypodermic administration of morphin and atropin or morphin and scopolamin

Local anesthesia with  $\frac{1}{2}$  per cent of novocain or one of its equivalents is much to be preferred because the patient can assist in breathing according to direction during the operation There is no danger from aspiration pneumonia and no danger from irritation of the lungs due to ether Chloroform is much less likely to irritate the lungs but is infinitely more dangerous than ether

If ether anesthesia is employed it is wise to operate with the patient in a sitting position well supported on a table or

ranged for this purpose because much less anesthetic is required because of the anemia of the brain due to the position and the patient is much less likely to inspire pus into the healthy lung due to compression of the diseased lung during the operation. Local anesthesia as described above is so simple safe and satisfactory that we always use this method in preference to general anesthesia.

*Hemorrhage*—These patients do not bear the loss of blood well and consequently every bleeding vessel should be clamped at once and all oozing should be prevented by pressure with gauze pads.

*Perforation of Pleura*—It is usually possible to avoid perforating the pleura by carefully stripping the periosteum of the ribs before resecting. We are in the habit of thus freeing all the ribs to be resected at one sitting before any of them are cut because then one can tampon the gauze against the pleura and make gentle gauze pressure as one rib after the other is cut away.

There is some danger of the patient bursting the pleura by violent fits of coughing. In case the patient begins to cough the operation should at once be interrupted and gauze should be placed against the pleura and held with gentle pressure and the patient should be directed to cough more. Strange as it may seem these patients have always stopped coughing almost at once upon being asked to cough more while they have not been able to stop coughing if requested to stop.

*Number of Ribs to Be Resected at One Sitting*—There is great danger in doing too much at one sitting. Patients often seem to be in such excellent condition that the surgeon feels inclined to remove portions of all the ribs at one sitting but this is taking unnecessary risk because these patients may collapse at any moment and this may prove fatal. We now limit the number of ribs to be excised at one sitting to six and in less vigorous patients we sometimes resect only three or four at one sitting. It is best however not to postpone the subsequent operation longer than six weeks.

*Strapping of Chest*—We have found it much more satis-

factory to pass the rubber adhesive straps entirely around the chest because the patient will then breathe with the good lung by using the diaphragm and this form of strapping immobilizes the diseased lung much more perfectly and by using catgut for suturing the skin and permitting the drainage tube to project from the lower end of the wound so that it can be withdrawn on the second or third postoperative day without disturbing the dressing the primary immobilization may be left undisturbed for several weeks

By observing all of these details this operation promises to become exceedingly useful to a large number of patients who are now thoroughly disabled and whose lives can be greatly lengthened and who can again take up their former occupations. Of course every care must be given to hygiene and nutrition in these as in all other cases in which tuberculous conditions have been relieved by surgical treatment



## CLINIC OF DR LEWIS L McARTHUR

ST LUKE'S HOSPITAL

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### REPAIR OF THE COMMON DUCT

Presentation of Five Cases Illustrating a Method of Common Duct Repair    Review of the Literature on This Subject

I WISH to discuss with you this morning the subject of common duct repair and present some cases illustrating the method of repair employed. The first patient was referred to me by Dr Lewis of Dubuque Iowa who gave me the following history

A man of middle age (forty eight) who while seeking operation for a simple right inguinal hernia at a neighboring clinic awoke to find that an appendectomy and the removal of a stone from the gall bladder added to his herniotomy had been done. With a biliary fistula persisting for a year he returned to the clinic when a cholecystectomy was done with prompt recurrence of the biliary fistula. After another year's interval of alternate opening and closure followed by jaundice and fever he returned for the third time to the clinic for search for the source of common duct obstruction. During this fourth interference so severe a hemorrhage occurred as to make it necessary to desist leaving the hemostatic forceps *in situ* and packing the wound returning the patient to bed to recover from loss of blood shock etc. The patient recovered and the wound healed (with the fistula persisting) he returned home. While the fistula was draining the patient was comfortable when closed for three or four days there was recurrence of jaundice chills fever and common duct symptoms. After a lapse of several months the patient was brought to me.

With the above history an exploratory operation was made

following with great difficulty the course of the fistulous tract through a mass of adhesions of the stomach liver colon and duodenum to its source in a small remnant of the cystic duct big enough to admit the index finger tip and containing mucopurulent bile with black biliary grit. Splitting open this pouch and its communication with common duct the latter was found dilated above this point sufficiently to permit palpation of right and left hepatic branches below this point an average sized probe could be passed down into the duodenum. Two stones could be felt and were removed from the dilated common duct with mixed mucopus and grit. With the probe down the common duct palpation revealed the duct surrounded by much indurated cicatricial tissue but as the duct was patulous to probe and fluids no effort was made to remove the narrowed portion or to divide the same. A No 6 soft rubber catheter was passed down into the duodenum and the wound was closed after excision of the remnants of the cystic duct.

Recovery was uneventful. The catheter was utilized while *in situ* to flush out the circulatory system and kidney by introduction of 2 to 3 liters of sterile water daily into the duodenum this clearing up the jaundice rapidly. The patient returned home in seven weeks with the wound closed.

For four months following his return home the patient had occasional attacks of obstructive symptoms with septic reactions. At the end of the four months the wound was reopened and a stricture found below the formerly opened area the common duct being this time opened nearer the duodenal junction. The probe passes easily into the duodenum. When trying to probe upward stricture found that admits only the smallest size probe. Divulsion of stricture and excision of scar tissue sufficient to admit No 16 English sound. On splitting open the stricture several small black biliary calculi are discharged with free flow of bile. Insertion upward into dilated duct of rubber tube with double reverse cuff fastening same there with chromic gut then passage of other end well down the duct into the duodenum so that 6 to 7 inches are free in duodenal lumen. Wound closed with cigarette drain down to junction of duct ends.

Healing was uneventful no bile escaped through wound patient returned home in five weeks all symptoms had disappeared

Sixty three days after its insertion the tube was passed The patient never had a recurrence of the old symptoms and died some years later with a carcinoma of the stomach

The second patient Mrs B entered St Luke's Hospital for obstruction of the common duct with jaundice Reopened the abdomen through old incision for cholecystectomy No stones palpable in common duct Pus blood albumin bile and casts (hyaline and granular) in urine Quick insertion of 2 tubes at point of probable ligation of former cystic duct where stricture was found and split One tube was inserted toward the liver in proximal end and one downward toward the duodenum and the wound hurriedly closed the aim being to relieve cholemia by the simplest procedure Recovery was good but there was some intermittent jaundice itching was gone at the end of the week One month later she was still somewhat jaundiced

Second operation was performed six weeks later Fistulous tract injected with methylene blue and tract followed through adhesions to the common duct Opening in it was enlarged sufficiently to insert a  $\frac{3}{8}$  inch rubber tube into the duct On the upper end a cuff or reverse had been turned back in order to enlarge its caliber and retard its escape into the duodenum The tube was about 4 inches long The common duct was sutured over the tube at the slit in the stricture The wound closed with drainage Wound closed on the eleventh day Stools became dark and urine light Discharge on the nineteenth day

The third patient Mrs S presented a typical history of biliary colics nausea vomiting and jaundice Gall bladder was drained seven years before after removal of stones Reoperation revealed an hour glass stricture of the gall bladder Compartment at fundus filled with stones below stricture (probable former purse string site) The gall bladder was thickened and infiltrated The cystic duct was ligated with artery and

vein and cholecystectomy made. The drain was inserted down to the stump. There was free flow of bile on second day. The wound healed.

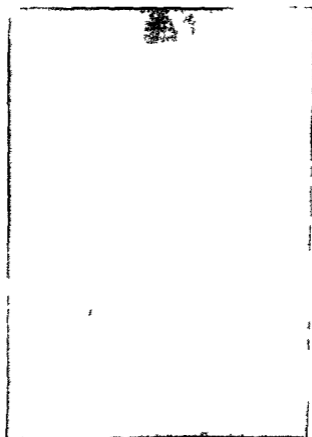


Fig 415—Case III. Full length catheter inserted and passed by both ends twenty-fourth day.

Five months later the patient was sent to the hospital with a chill and fever, leukocytes 15,400, pulse 100, temperature 102.4 F, urine highly colored, stools light colored. The temperature was normal on the fourth day and the patient was discharged on the sixth day.

The patient returned to the hospital in two months with jaundice nausea and vomiting pruritus

*Operation* —The abdomen was opened through the old scar The common duct was identified and opened The probe passed downward easily into duodenum without obstruction passed upward to meet the obstruction near the hilus of the liver The

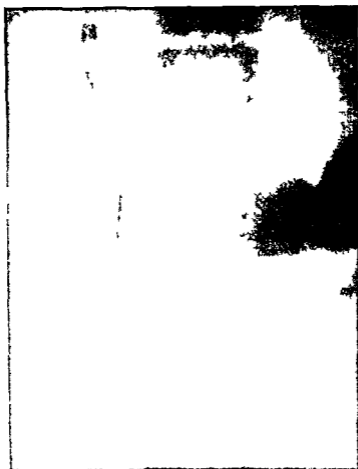


Fig 416—Case III Same with bismuth in duodenum

duct was split upward along the probe to the obstruction due to connective tissue constriction and scar tissue A portion of a No 7 soft rubber catheter was inserted with funnel above the constriction and the other end was passed down duct into duodenum and then sutured over catheter and a Bullitt drain inserted to the field of the suture Drain was removed on the seventh day stools normal on the second day

vein and cholecystectomy made. The drain was inserted down to the stump. There was free flow of bile on second day. The wound healed.

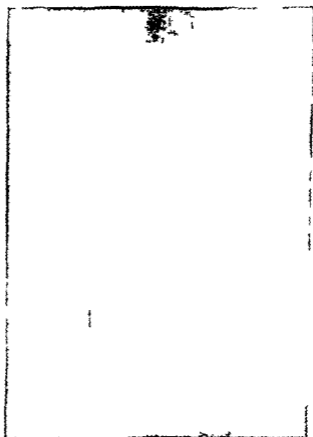


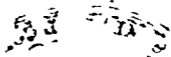
Fig 415—Ca III. F t t be too hort. In pla n weeks. Sec  
ond operat on full length cathet r inserted and pa d by bowel n the  
twenty s enth d y

Five months later the patient was sent to the ho pital with a chill and fever leukocytes 15 400 pulse 100 temperature 102.4 F urine highly colored stools light colored. The tem perature was normal on the fourth day and the patient was discharged on the sixth day.

of the gall bladder. Immediate frozen section showed it to be lined with epithelium similar to the duct. I immediately realized my mistake, told both the family physician who had watched and complimented the careful operation and the relatives frankly what had happened and explained the necessity of immediate opening of the wound to resuture the duct. This was done. The ends of the duct were picked up and the catheter was passed down almost entire into the duodenum through the distal portion. Inasmuch as there had never been any dilatation of the common duct it was not feasible to insert upward the funnel end of the catheter so the funnel was amputated and the cut end passed up to the liver. In order to anchor it in place a medium sized wax silk ligature was tied to the catheter at the area uncovered by the duct and anchored to the surface of the skin by adhesive plaster. Then the ends of the ducts were approximated toward one another to within  $\frac{1}{2}$  inch. The wound was sutured. Some bile discharged until the anchor thread was cut four and a half months after operation. The catheter passed seven weeks after thread was cut (Fig 417). The wound ceased leaking in ten days after the thread was cut. The patient was then apparently perfectly well and remains so.

Disregarding free fascial transplants as having the proved but temporary successes and avoiding the much more serious surgical procedures of Walton and Mayo there remains the utilization of some form of tubular reconstruction.

I first employed this method in 1907. Search through the literature fails to reveal earlier application of this method of correction of common duct defects and not until 1909 did Sullivan report the results of his laboratory experimental work along these lines. In an analogous manner in November 1905 Jenckel of Germany endeavored to establish a new canal by using a tube one end of which was sutured in the proximal duct the other inserted through an opening into the duodenum made after the Witzel method for temporary gastric or intestinal fistula—that is by burying the tube by suture in a fold of the duodenal wall for 1 or 2 inches before perforating



the same. The great value of Witzel's suggestion is quick obliteration of the temporary tract and closure of the fistula on removal of the tube. The very thing to be avoided then in establishing a new channel of this nature. In point of fact in the case mentioned Jenckel after three weeks inserted his

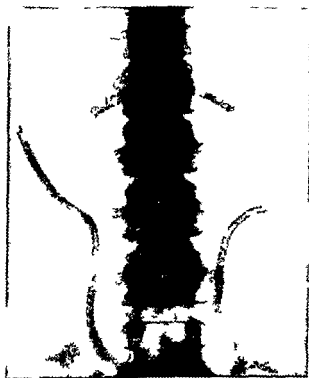


Fig. 417.—Case V. Full length catheter inserted. Anchored by silk thread to the abdominal wall. In situ and one-half months. Anchored to the abdominal wall by suture. November 7th.

finger into the fistulous tracts to remove the tube and by traction on it tore open the duodenum along the Witzel suture with a resulting desperate duodenal fistula and extremely tedious convalescence. Strangely enough after months the wound epithelialized internally sufficiently before it healed externally to establish a nexus between the proximal stump and

duodenum<sup>1</sup> So that after more than a year's time the patient was discharged cured

Following Sullivan's early recommendations there came many applications of the same in practice usually with some means for the removal of the tube like the well known T tube now largely abandoned because many times the short arm of the T tube has broken off in the duct during the effort to extract it thus necessitating another surgical interference If a T tube be used a caution should be voiced as to the danger of rotting very quickly the rubber by the injection of vaselin or oils after Bevan's suggestion as tubing is very speedily rendered friable thereby The tying of the strong ligature to the tube *in situ* so that it may be pulled out after some months has the disadvantage of tearing open the newly formed duct with a potential recurrence of stricture The recommendation to leave a short tube permanently in place is to be condemned because of the ultimate deposit of bile with recurrence of symptoms as in the second patient

As yet I have found no reference to the dependence on an enlargement of the proximal end of the tube sufficiently to delay its escape until the tract can epithelialize nor any suggestion of utilizing the duodenal tug of every peristaltic wave finally to make it pass off by the bowel These two factors are in my opinion most important to the successful outcome of one of the most difficult procedures the surgeon meets with

The ordinary soft rubber catheter with its funnel shaped end or the soft rubber catheter a demeure trimmed to suit meets these indications better than anything else I have used Always at hand and in assorted sizes to meet the individual case one need not resort to any special device In the vast majority of cases the proximal end of the duct is so well dilated that the funnel end by simply folding on itself can be inserted proximally and then held there by a chromic catgut encircling suture the balance of the catheter having been passed through duct previously wholly into the duodenum The ends of the duct are then approximated as well as possible by sutures and the wound closed with a cigarette drain

In the few cases in which the repair of the common duct is to be made immediately following the accidental or intentional removal of a segment the proximal end of the duct is often no larger than the distal end and will not permit the introduction of a cuff or funnel. In the fifth patient I was successful in overcoming this difficulty by temporarily anchoring with a single silk thread tied around the catheter brought out through the incision and attached to the skin with adhesive. Held thus in place four and a half months the tube passed seven weeks after cutting the anchoring thread.

Only too frequently it happens that the obstruction has existed so long it proves impossible to discover the distal end of the duct atrophic and buried in adhesions and scar tissue. When this is the case either the method recommended by Walton and by Mayo of a pedunculated flap of duodenal wall containing all three layers should be sutured to the proximal end of the duct and the duodenum mobilized so as to be sutured well in contact with same. When this cannot be done then with the tube introduced into the proximal end and fastened there as before suggested the balance of the catheter is inserted in the duodenum through an opening previously encircled with a good silk purse string suture made in that part of it most easily brought up to the proximal end of the duct. By this means I have twice overcome the difficulty. Painstaking efforts however should be made to find the distal end and only then abandoned when further efforts would seem to jeopardize the patient's life because no anastomosis of duct to stomach or duodenum is as free from danger of an ascending infection as is the ampulla of Vater. Two of the cases reported of the latter type while showing no jaundice and no clay-colored stools have had from time to time all the symptoms that attend a moderate cholangitis chill fever malaise nausea without jaundice or bile in urine while those in whom it was feasible to utilize the ampulla have been much more free from the disquieting reminders of their old ailment.

## CLINIC OF DR. GATEWOOD

### PRESBYTERIAN HOSPITAL

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#### MIXED TUMORS OF THE PAROTID GLAND

Patient Presenting a Tumor of the Right Parotid Gland  
Differential Diagnosis    Operation    Result

FROM several standpoints the case I am about to present to you is of considerable interest. First, as to diagnosis, which I think is fairly easily made. Second, as to prognosis, which may depend upon microscopic findings, and third, on account of the peculiar nature of these tumors.

This man is thirty-eight years old, white, and single. His general health is good, and he is steadily adding weight to his already obese body. About four years ago he noticed a small swelling just in front of his right ear. This was gradually increased in size until it is now, as you may see, about the size of an English walnut. While the patient thinks that the growth has been intermittent, it has been progressive, and apparently more rapid during the past six months. He has had no pain of late, but states that there was slight soreness at the time he first discovered a small lump. Eating has no influence upon the size of the tumor.

This mass you see is firm and almost smooth in outline. It is not tender. It is located in the region of the right parotid gland and extends backward to the base of the ear. There is a slight irregularity in the outline of the posterior portion of the mass. While the tumor is fairly fixed, it seems separable from the mandible, thereby excluding bony tumors of the jaw. We should have some notion of the pathology of this tumor before we proceed to operate. What are we to consider? Naturally, the duration would exclude even the most chronic inflammations, although we occasionally see a low grade parotitis lasting over

months. Tuberculous lymph glands in this vicinity are not uncommon but are almost always multiple and the absence of other glands taken together with the long history without inflammation eliminates tuberculosis from consideration.

*Salivary calculi* weighing 30 to 60 grams have been reported. These stones usually give early symptoms of duct obstruction and nothing is more characteristic than to see a salivary gland increase in size with accompanying pain when a patient is given a lemon to suck. Patients with salivary calculi give such a typical story of pain and swelling after eating that the diagnosis is usually readily made on the history alone. Stones as a rule conform to the shape of the ducts and are not globular in form except when small.

A *retention cyst* either as the result of stone occlusion of a duct or following an inflammation is not uncommon. Cysts are almost always fluctuant and vary definitely in size from time to time. Fluctuation does not exclude neoplasm; however, for cysts are common even in carcinoma. Of the neoplasms we must consider adenoma, carcinoma, sarcoma, and the so-called mixed tumors.

*Benign adenomas* of the parotid glands are very rare. They are slowly growing tumors, remaining encapsulated and intimately connected with the gland. They may be solid or cystic, the cysts containing much mucus or serous secretion. They contain a moderate amount of stroma without trace of mucoid or cartilaginous material.

*Carcinomas* are much more common. They may occur as pure epithelial tumors or more often as a part of the picture of a mixed tumor. Whether transition from a benign to a malignant neoplasm occurs in this group or the malignancy is primary is still a much disputed question. Whatever the relation between the mixed tumor and the carcinoma may be, the clinical picture of each is very characteristic. Carcinomas develop rapidly, very early invading the entire parotid and giving regional lymph node involvement. General metastases are common and prompt recurrence after extirpation is the rule.

*Sarcoma* of the parotid gland according to a number of men like Kuttner Koenig and Kaufmann is not uncommon especially as a part of the mixed tumors They have described four forms namely simple sarcoma fibrosarcoma myxosarcoma and chondrosarcoma Koenig and Kaufmann state that these types may be intermingled the same tumor frequently containing various soft elements along with cartilage and even bone Leaving out of consideration the lymphoid tumors Ewing thinks that true sarcoma of the parotid has not been demonstrated and that these tumors usually considered as sarcomas are in reality round cell carcinomas Whether of epidermal or connective tissue origin these solid round cell tumors form a distinct group whose growth is rapid and whose malignancy is marked

The *mixed tumor* is by far the most common neoplasm of the salivary glands There are many reports of such tumors in the literature one man reporting as many as 60 cases A review of the records of the Presbyterian Hospital for the last five years reveals at least 13 cases of parotid tumors in patients varying from sixteen to sixty four years of age the average being about thirty nine years Wood reported a rapidly growing mixed tumor in a child seven months old The great majority occurs somewhere between twenty and forty These tumors may be found in any of the salivary glands although according to Kuttner 90 per cent occur in the parotid During the same period but one benign tumor of the submaxillary glands was found at the Presbyterian Hospital According to Ewing most of these cases have a quiescent period preceding their active growth One of the patients whom I saw about four years ago first noticed his tumor twenty years ago The majority had noticed trouble for more than a year the average duration being almost five years In nearly all of our cases there was a history of rather rapid growth of the tumor a short time before they sought surgical relief

From these various pathologic possibilities what shall we choose? The location of the tumor the history of its slow growth the lack of fixation to the jaw the absence of any lymph node

enlargement and the theory of probabilities all justify us. I believe in making the preoperative diagnosis of mixed tumor of the parotid although a benign adenoma cannot be entirely excluded.

We shall now proceed to remove the tumor and discuss the pathology after we have sectioned it. I am carefully infiltrating the area with - per cent novocain to which has been added 1:100,000 adrenalin. I may produce temporary paralysis of the right side of the face by the novocain and in that event it will be impossible to tell for some hours whether the facial nerve has been damaged by the operation. By making a curved incision just posterior to the lobe of the ear and extending below the mandible of the jaw in this way I am avoiding the facial nerve which as you know courses through the parotid gland. By strong retraction I am able to push the portion of the parotid containing the tumor into the wound. Fortunately in this case we have to deal with an encapsulated tumor. In some instances the tumor is so intimately associated with the parotid substance that it is impossible to enucleate it. Sometimes there are several tumors in the gland. Of course if one feels relatively certain that the tumor is malignant a radical resection of the parotid and even of all of the tissues in the neighborhood should be done regardless of the resultant deformity. I have now enucleated the entire mass which is about the size of an English walnut. There are only a few vessels to be ligated the blood supply not being very great. As I am closing the wound I will insert a small piece of collapsible rubber as a temporary drain. A snug bandage should be applied to prevent the formation of a dead space or of a hematoma. We can remove this bandage and the drain at the end of forty-eight hours and leave the wound without dressing. I have handled face wounds without dressing for a long time simply touching the wound with a little tincture of iodine on an applicator once a day and have never had any infection as a result. You see our patient can whistle showing that I have not injured the facial nerve.

Let us now proceed to examine the tumor. It is white and

slightly irregular but quite smooth in contour. On section it presents a rather characteristic appearance. Parts of it are granular almost crumbling between the fingers. Other parts are more fibrous and slightly pink showing the presence of a better blood supply and here it is homogeneous and pearly, but not hard. I feel that we can say without microscopic section that this is a typical mixed tumor of the parotid gland. The encapsulated growths such as this one is do not tend to recur after excision. Even those cases in which the tumor has been removed by morcellement frequently do not recur. Occasionally however those which are apparently quite benign will recur as late as nine years after excision. Wood reports 45 per cent of recurrences in his series of 37 cases of which 70 per cent were checked by secondary operations. It is characteristic however that those tumors which have been operated on a number of times become increasingly more malignant in creasing in cellular elements and becoming more vascular. Even very large and rapidly growing mixed tumors in this region rarely invade the lymph nodes before operation. After an successful removal on the other hand the cervical glands may become progressively involved with extension at times into the mediastinum. Generalized metastases are quite rare except in rapidly growing carcinomas.

What do we mean by mixed tumor of the parotid? Generally speaking we refer to a tumor of complex structure with epithelial elements in the form of strands, alveoli or diffuse masses with tissues usually considered of mesoblastic origin chiefly cartilage and cellular connective tissue. Any element may predominate though all the cell types are represented.

The etiology and pathology of these tumors have been the subjects of much controversy for nearly half a century. While they were originally described as carcinomas following the lead of Koenig and Kaufmann they were considered sarcomas. Wirtmann advanced the idea that they were derived from the lymphatic endothelium. The cells are small often polyhedral but may under pressure be flat or spindle shaped and in some cases the cells reproduce a structure closely resembling the

spindle celled sarcoma. The presence of growing masses of hyaline or cartilaginous material further suggests the mesoblastic origin of these tumors. Ewing on the other hand maintains that the cells show no minute characters which permit their identification as endothelium. The long strands of cells resembling sprouting vessels may be produced by carcinoma and as Hinsberg pointed out in many cases spines and fibrils may be demonstrated connecting the cell. The structures identified as lymph spaces may equally well represent lumina of gland alveoli. The mixed origin that is mesoblastic and epiblastic probably accounts for certain of these tumors in which the almost purely cartilaginous or the purely carcinomatous element predominates. Some of these tumors belong to the class of basal celled carcinomas (adenoid cystic epitheliomas) as Krompecher has pointed out. Others probably are derived from the ducts and acini of the salivary glands.

It seems to me that no single theory will explain all of the mixed tumors. Some are distinctly adenomatous and probably arise from the tubules or ducts of the gland. Some of the encapsulated tumors arise from inclusion or embryonal rests as branchial cleft remnants are common in this location. Whether any of them are of endothelial origin is very difficult to say although the preponderance of evidence is against it in spite of the fact that they behave very much like endotheliomas found elsewhere. Ewing has apparently proved that many of them are of epithelial origin although to concede this makes it necessary to believe that cartilage can be derived from epithelium.

Occasionally other tumors such as hemangiomas and lymphangiomas are observed in the parotid. They are usually congenital and do not appear to be related to the mixed tumors.

Microscopically the character of these parotid neoplasms varies enormously in different parts of the same tumor. This often causes very misleading reports. For example the sections from one of the cases observed during the last few years appeared to be quite benign. However recurrence after removal was quite prompt and the patient died later of carcinomatous

cachexia. A careful study should be made of various parts of the tumor after it has been removed before making a definite prognosis. Even then we are apt to be misled as some of the cases which are definitely carcinomatous do not occur for a long time and seem to be held in check very well by x-ray therapy. As a precaution in all cases I think x-ray should be

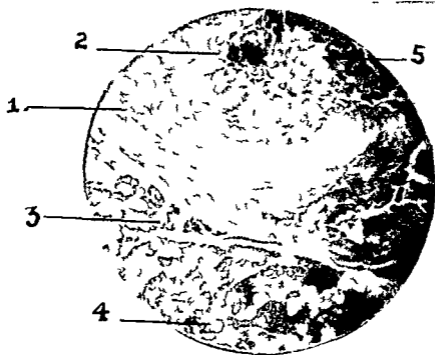


Fig 418 —Microphotograph (low power) of mixed tumor of the parotid  
 1 Connective tissue capsule of tumor 2 Tumor showing masses of cells resembling sarcoma under low power 3 Normal parotid gland acini. A small portion of gland was attached to capsule of tumor 4 Salivary duct 5 Homogeneous (mucoid) material separated by cords of tumor-cells

advised. It will cause an atrophy of the glandular tissue but this is of little consequence.

In a typical case there are strands of cells separating more or less homogeneous mucoid or cartilaginous material. These cells may take the shape of tubules or may be in masses so packed as to look like a sarcoma. Pearls and intercellular bridges have been demonstrated in many cases proving beyond

question the epithelial origin of parts of the tumor. Sometimes the tumor is enveloped by a connective tissue capsule again it may be intimately mixed with normal parotid tissue.

In conclusion we have removed in its entirety an encapsulated tumor of the parotid gland without injury to the facial nerve. From the history, the incidence of such tumors and the gross section it seems fair to conclude that we are dealing with

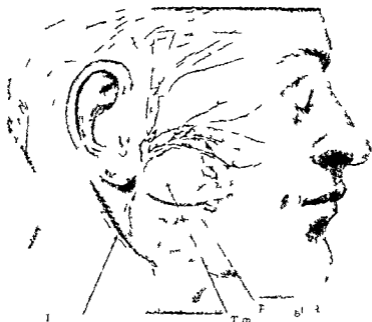


Fig. 419—Schematic representation of the relationship of the facial nerve to the parotid gland, how pushed forward by the tumor.

a mixed tumor of the parotid gland which probably will not recur. We will have numerous sections made for microscopic study.

**Postoperative Note (Three Months Later)**—The patient has made a complete recovery from his operation and has no evidence of recurrence to date. Sections of the tumor are fairly uniform in structure. They consist of strands of cells, some of which are distinctly glandular with tubule or alveolar for

mation others are in compact arrangement resembling connective tissue cells or better a spindle celled sarcoma There is no cartilage in any of the sections I have examined although there is much mucoid tissue in some places giving parts of the tumor the appearance of a myxoma The nuclei of the cells are ovoid well defined and are surrounded by a variable amount of cytoplasm The cell walls are very distinct in most places No pearl formation is noted although squamous cells are found in many places There are spaces lined with cuboidal cells in which erythrocytes are seen These may equally well be new blood vessels lined with endothelium or tumor spaces with hemorrhage There is no question about the diagnosis and treatment in this case You are entitled to your own opinion as to the derivation of the cells of the tumor although it seems to me they are distinctly epithelial



# CLINIC OF DR ALBERT E HALSTEAD

ST LUKE'S HOSPITAL

(REPORTED BY DR FREDERICK CHRISTOPHER)

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## FOUR CASES REQUIRING LIVER SURGERY

### CASE I GUNSHOT WOUND OF THE LIVER

PATIENT Edward Egan aged twenty six St Luke's Hospital No 160 981 was admitted to the Surgical Service of Dr Albert E Halstead on September 16 1922 Immediately preceding his admission the patient was held up by three colored men and shot The muzzle of the gun was held near the victim's body On admission to the hospital it was noted that the wound of entry was in the right upper abdomen at the costosternal angle and that there was no wound of exit The abdomen had a board like rigidity and was somewhat tender The patient complained of pain in the abdomen and in the right chest and shoulder no dulness in the flanks The pain in the chest was a sharp one and was occasioned by breathing No evidence of cord injury

The patient was admitted at 3 A M with a pulse of 72 which became steadily more rapid until it was 104 at 6 30 A M There was shortness of breath and thirst The patient's condition was serious and at 7 10 A M operation was done by Dr Halstead

The abdomen was explored through an upper midline incision and it was found that the bullet had entered the anterior surface of the liver and after passing completely through that organ had lodged in the tissues posterior to it (Fig 420) The bullet wound of the liver from which there was a profuse hemorrhage was packed with sewed gauze no attempt was made to remove the bullet Some of the blood in the abdominal cavity was sponged out and the wound closed with drainage

The postoperative course was rapid and favorable. The packing was removed a little at a time until it was entirely out on the sixth day postoperative. On October 18, 1922, twenty nine days after the operation, the patient was discharged from the

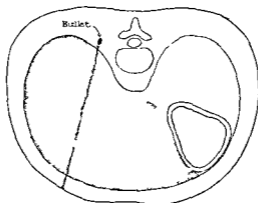


Fig. 420—Diagram of the abdominal cavity showing the location of the bullet wound in the liver.

hospital, having been up and around several days and his wound completely healed.

## CASE II. ECHINOCOCCUS CYST OF THE LIVER

Patient Alek Citidis, aged twenty seven, St. Luke's Hospital, No. 99464, was admitted to the Surgical Service of Dr. Albert Halstead on May 8, 1927. The patient was a Greek who had been in the United States for the preceding seven years. Ten years previous to the admission he had undergone an operation in the old country for abscess of the liver and was confined to the hospital three or four weeks at that time. Up to a year and a half before admission the patient felt very well but since that time there has been some pain and slight swelling in the upper right quadrant. This difficulty was not sufficient to confine him to bed. Four days previous to admission an opening appeared in the old scar and a pint or more of watery fluid escaped. The patient thought that some 2 quarts of fluid had escaped from the sinus in the four days preceding

admission The history is otherwise negative save that the patient always had four or more dogs and was very fond of them he used to even take one of them to bed with him Patient was a shepherd in Greece as a boy and secured nourishment by sucking female sheep

The physical examination was negative save for a discharging sinus in the upper right quadrant of the abdomen from which was obtained characteristic hooklets in several small echinococcus cysts

Urine showed albumin and a few granular casts Blood examination Erythrocytes 4 540 000 leukocytes 11 900 hemo

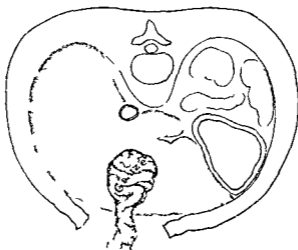


Fig 421 —Diagrammatic cross section of liver showing method of packing cavity in liver after removal of echinococcus cyst Case II

globin 74 per cent (Sahli) differential count small lymphocytes 30 per cent large lymphocytes 4 per cent polymorphonuclear neutrophils 65 per cent polymorphonuclear eosinophils 1 per cent

Operation May 19 1916 Dr Albert E Halstead Gas induction and ether anesthetic An incision 4 inches long was made along the lower border of the rectus on the right side The cyst cavity was opened and drained It was then dried out as well as possible and cauterized with strong hydrochloric acid and the cavity packed with iodoform gauze (Fig 421) The wound was closed at the lower angle with silkworm sutures

After operation dressings were done daily and the cavity which was lined with a granulating surface became steadily smaller. The patient was discharged on July 18 1916 two months after admission with the wound practically healed. The wound healed shortly afterward and the patient has been cured ever since. He was a soldier in the World War.

### CASE III ABSCESS OF THE LIVER FOLLOWING APPENDICITIS

Patient Norman Robinson aged thirty two St. Luke's Hospital No. 156 508. Admitted to the Medical Service of Dr. Joseph A. Capps on March 22 1922. The patient has always been in fair health save for an indefinite gastric distress coming on after meals. Three weeks previous to admission following a transient attack of nausea in the evening he was seized with violent abdominal pains at 5:30 in the morning. The abdomen was rigid and tender. A few hours later he was operated upon and the abdomen was found to contain a great deal of pus. The appendix which apparently was the cause of the trouble was removed and the wound was closed with drainage.

The convalescence was uneventful save for a patchy sore throat with fever a week after the operation and which lasted for a few days. The abdominal incision healed quickly and the patient was home twelve days after the operation. Since going home the patient felt much worse and for the week preceding admission to St. Luke's has had tenderness in the upper abdomen especially in the epigastrium and the left upper quadrant. For the last eight days there has developed a tender spot on the left trapezius ridge. There was also a sharp catching pain in the left breast which with the pain in the shoulder caused the patient to jerk the head back with each respiration. There is dyspnea chills and sweats. The fever goes as high as 104° F the curve having sharp ascents and descents. There appeared to be a slight bulging in the epigastrium. In the right upper quadrant there is some rigidity and marked tenderness. The leukocyte count was 12 000 the erythrocytes 4 980 000 and the hemoglobin 95 per cent. The urine showed a trace of albumin with occasional hyaline and granular casts.

On March 23 1922 Dr Albert E Halstead saw this patient in consultation with Dr Capps The diagnoses considered were a subdiaphragmatic abscess probably due to a recent perforated gastric ulcer or an abscess of the liver

Operation by Dr Halstead March 24 1922 On opening the abdomen through a midline incision adhesions were found bringing the stomach to the liver The abdominal cavity contained a bloody serous fluid The liver itself was very much enlarged and was covered with a fibrinous exudate The falciform ligament was pushed to the right side In the anterior part of the left lobe near the midline a soft spot was found

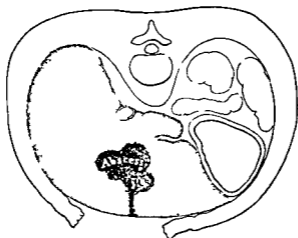


Fig 422 —Diagrammatic cross section of liver showing situation of abscess-cavity mentioned in Case III

This position was explored and from a depth of  $1\frac{1}{2}$  inches below the surface of the liver pus was aspirated There was no collection of pus or fluid in the lesser peritoneal cavity The abscess was not incised but packing was so inserted as to separate the liver from the abdominal cavity The wound was only partly closed and in such a manner that the soft area in the liver presented to the exterior Packing was placed around the wound edges The abscess was left unopened at this time as it was hoped that in a few days adhesions would form between the parietal peritoneum of the abdominal wall and the visceral peritoneum of the liver in such a manner as to completely wall

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The patient complained of a diplopia deafness, and feeling of fulness in the head. Beneath the scar of a recent operative wound in the right upper quadrant is a firm smooth mass of considerable size. A diagnosis of tumor of the liver possibly a cystic tumor was made.

Operation by Dr. Halstead October 7, 1921. After dissecting through numerous adhesions the gall bladder was seen it was hard and distended. On cutting it open a peculiar putty like bile was scooped out. The gall bladder was removed. The liver in the neighborhood of the gall bladder was replaced by a dark colored grumous material. This was thoroughly cleaned out and the opening in the liver was packed. The dark colored putty like material was examined by the pathologist and found to be a melanosaarcoma, and in it were cotton threads doubtless the remnants of packing at the previous operation. There were also crystals which looked like cholesterol and green and yellow blood pigments. The patient's postoperative course was satisfactory. The packing was gradually removed and on the thirty first day postoperative the patient was discharged.

The patient was readmitted to the hospital on November 29, 1921 for the purpose of having a decompression in the hope of relieving the symptoms attributable to increased intracranial pressure. As little improvement was to be hoped for however the operation was not done. In December, 1922 the patient was still alive and in fair health.

The most probable explanation of the pathology in this case seems to be that entirely independently of the cranial neoplasm removed in 1910 the patient developed a primary melanosaarcoma in the choroid of the right eye which later gave metastases to the liver. The curious feature of the case is the extraordinary length of time of life which patient has enjoyed since the first appearance of the malignant tumor.

#### DISCUSSION

The liver may be injured either subcutaneously or through a wound. For practical purposes wounds of the liver may be divided into gunshot wounds and stab wounds with the former

nearly twice as common as the latter. The right lobe is injured six times as frequently as the left.<sup>1</sup> Of penetrating abdominal wounds 16 per cent involve the liver, 1 per cent the kidney, 27 per cent the spleen and 0.4 per cent the pancreas.<sup>2</sup> In 1887 Edler found the mortality from gunshot wounds of the liver to be 39 per cent. Turner and Ouvray report 14 cases of gunshot wounds of the liver with 4 deaths. The most recent statistics are those of Tilton<sup>3</sup> who in ten years at New York hospitals found the mortality of gunshot wounds of the liver which were operated upon to be 28.5 per cent. Gunshot wounds of the liver are found many times to be associated with perforating wounds of the diaphragm, liver, stomach or intestines and kidney. The chief factors in the diagnosis are (1) The situation of the wound of entry, (2) the symptoms of internal hemorrhage and of shock. Finsterer<sup>4</sup> noted a bradycardia in 12 out of 13 liver ruptures and 2 gunshot wounds of the liver and believes it to be a constant and characteristic sign of liver injury.

In all cases where there is even a possibility of a gunshot wound of the liver immediate operation is imperative. It is important to examine the entire liver as wounds of exit are not infrequently found in unsuspected locations. The purpose of the operation is to control hemorrhage and experience has shown that gauze packing is the best for this purpose. Halstead<sup>5</sup> on one occasion drew the omentum through the hole made by the bullet in the liver and effectually stopped the hemorrhage. Should suture of the liver be thought advisable a blunt supple needle and thick suture material should be used. The thermo-cautery has been found to be of very little value in arresting hemorrhage from the liver.

The terms hydatid and echinococcus cyst are used interchangeably. Both are derived from the Greek, the former meaning a vesicle of water and the latter hedgehog and berry. The origin of the echinococcus cyst is from the dog tapeworm, the *Tænia echinococcus*. If man ingests the eggs of this parasite they are liberated in his stomach. The embryos penetrate the intestinal wall and reach the liver or other organs. There the larval stage is developed and a cyst begins to form. More

commonly the cyst is unilocular the multilocular cysts being more rare. The disease occurs in this country but is more prevalent in Europe. Over half the cases are between the ages of twenty and forty. In Iceland Silesia Australia and Province of Manitoba in Canada the disease is very prevalent. The patients invariably give a history of association with dogs. Although an echinococcus cyst may arise in almost any organ of the body a comparison of statistical tables shows that these cysts occur more frequently in the liver than in all other parts of the body together.<sup>6</sup> The liver is doubtless most affected because it is the main depot of absorption from the intestinal tract via the portal vein. The cysts may reach enormous size.<sup>7</sup> In one case a liver thoroughly infested with cysts weighed 25 pounds.<sup>6</sup>

Echinococcus cysts of the liver are painless grow with moderate rapidity are dull on percussion fluctuate if near enough the surface and occasionally give the peculiar hydatid fremitus which is a curious vibratory thrill obtained by percussing the middle finger of the left hand when it is firmly laid over the tumor. Pneumoperitoneum with x ray has been recommended as a valuable aid in the diagnosis of echinococcus cyst.<sup>8</sup> If left unoperated the cyst may rupture spontaneously and take various directions it may burst into the abdomen or into the pleura or lung and the vesicles escape through the bronchial tubes and trachea. Rarely it may burst into the pericardium the stomach the intestines or rarely into the gall bladder and still more rarely into the vena cava when the contents will be carried as emboli into the right cavities of the heart. When the fluid escapes into the abdomen it sets up an urticaria which itches intensely.

The treatment of echinococcus cysts of the liver is always surgical. The operations may be divided into (1) incision and drainage and (2) incision and enucleation of the sac. The latter is the much more complete operation.<sup>9</sup> The wound surfaces should be carefully protected from the hydatid fluid as it has been shown beyond question that hydatid infection of these raw surfaces may occur.<sup>10</sup> Destruction of the living organ

isms in the cyst wall by anti septic solutions of formalin or corrosive sublimate previous to enucleation of the parent cyst has been recommended. Marsupialization is the term applied to the procedure in which the incision in the liver is carefully united to the peritoneum with catgut sutures. Tapping of echinococcus cysts is an uncertain and a highly dangerous procedure.<sup>11</sup>

The causes of single liver abscess have been enumerated by Pannett<sup>1</sup> as follows: (1) Amebic dysentery which is by far the commonest; (2) trauma which is next most frequent; (3) extension of a cholecystitis to liver directly is most unusual as is also (4) abscess due to a perforation of a simple or malignant ulcer of the stomach; (5) very rarely after typhoid fever; (6) hydatid cyst of the liver sometimes becomes infected and forms an abscess; (7) lastly and most rarely some septic focus in the abdomen leads to a portal vein infection of the liver and single liver abscess. The cause may be a gastric ulcer, appendicitis or even a septic stump left after an operation for pile.

The incidence of liver abscess following appendicitis is probably not so rare as Pannett has indicated. Bruggeman<sup>12</sup> collected some 28 cases of liver abscess as a complication to appendicitis in which there had been an operation and recovery. In a previous clinic<sup>14</sup> the writers carefully reviewed the rather extensive literature on pyelphlebitis and liver abscesses as sequelae of appendicitis. The anatomic relationship of the appendix to the liver is very significant. The appendical veins empty into the ileocolic vein, the latter into the right colic vein and that into the superior mesenteric vein which in turn empties into the portal vein. Infection is propagated toward the liver by either the continued thrombosis or septic emboli. Monro emphasized that the retroperitoneal lymphatics afford another route between the appendix and the liver.

Localized hepatic abscess should be evacuated by incision at the earliest possible moment. Three routes are possible for effective entrance into the abscess cavity:<sup>15</sup> (1) abdominal incision; (2) transpleural incision; (3) combined abdominal and transpleural incision. It is interesting to note that when large

areas of the liver are destroyed by acute infection the remainder will hypertrophy until the original weight is nearly restored<sup>15</sup>

Melanoma is a pigmentiferous tumor arising from a specific mesoblastic cell the chromatophore and possibly also from epithelial cells which have been modified by pigment production. It arises chiefly in the skin and the choroid coat of the eye, less frequently in the meninges rectum and other organs. The term 'melanoma' should be employed to emphasize the specific character of the tumor and its cells of origin. The possible origin from epidermal cells may be indicated by the term 'melanocarcinoma' and the sarcomatous character of other tumors is indicated as melanosarcoma<sup>16</sup>. Malignant melanoma develops in a small proportion of cases usually after trauma or incomplete extirpation. About one third of all melanomas originate in the choroid. The congenital nevus is the starting point of those originating from the skin. Primary melanoma of the liver is a very difficult diagnosis to establish<sup>16</sup>. Rolleston<sup>17</sup> in referring to 9 reported cases points out that no case can be accepted unless the uveal tract has been examined after death. This precaution has usually been omitted. In 2 cases very small uveal melanomas were discovered only at autopsy.

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# CLINIC OF DR HERMAN L KRETSCHMER

PRESBYTERIAN HOSPITAL

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## PYELOGRAPHY

**Pyelography One of the Most Valuable Diagnostic Aids in Urology Historic Review Solutions Used Technic Dangers—to the Kidney Itself, to the Patient Congenital Anomalies Demonstrable by Pyelography Other Urologic Conditions in Which Pyelography is of Value**

ONE of the most valuable diagnostic aids in urology is pyelography and when first introduced it was most frequently employed in urologic diagnosis only but in more recent years it has come to enjoy a very wide range of usefulness in general abdominal diagnosis The problems of differential diagnosis of lesions of the right upper as well as the right lower quadrant are familiar to all especially in cases giving an atypical history This type of case was often subjected to one or more exploratory operations many times without benefit to the patient In the differential diagnosis of the various possible lesions pyelography plays a most important role and one of the very striking features of pyelography is the fact that it reached this firm niche in our diagnostic armamentarium in but a few years Although at first it met with much strenuous opposition and still does one is justified in stating that with but few exceptions there have been few diagnostic procedures whose accuracy and value is now so generally recognized

**Historic**—The first pyelograms were made by Klose in 1904 in a case of complete double ureter He injected a suspension of bismuth into the pelvis of the kidney and ureter combined with radiography It was at once apparent that bismuth suspension was an unsuitable media for this purpose because of

the danger of leaving particles of bismuth within the kidney pelvis and along the ureter

Several years later Voelcker and Lichtenberg successfully demonstrated the outline of the kidney pelvis and ureter by means of colloidal silver using collargol. They attempted to outline the bladder in roentgenograms. They observed that the fluid placed in the bladder for this purpose had found its way up the ureter and kidney pelvis so that they were outlined in the roentgenogram. Following up their observations they then injected the solution directly into the renal pelvis through the ureteral catheter. Stimulated by their results they were able to report a series of cases of successful pyelograms.

Although Klose was the first to carry out pyelography, Voelcker and Lichtenberg's work resulted in stimulating others to follow in their footsteps. Although at first their work received but little attention the importance and value of this measure is now universally appreciated and recognized.

One of the first to appreciate the importance and value of this procedure was Braasch. With the enormous amount of material at his disposal and confronted with problems of differential diagnosis between lesions of the kidney and ureter and lesions of various abdominal organs he was soon in a position of having done more pyelograms than any man in this country if not the entire world. His publications deal with all phases of this subject and his monograph is a most important contribution to the subject.

**Solutions Used**—Various chemicals have been used for this purpose. As just stated Klose used bismuth which had the great objection of leaving the pelvis and kidney coated. Solutions of colloidal silver were used by Voelcker and Lichtenberg. They used a 5 per cent solution of collargol. This was really a suspension and had many objections so that its use was soon discontinued for solutions of the newer silver salts such as argyrol, cargentos and nargol. These solutions for various reasons were unsatisfactory and Uhle and Pfahler advised the use of an emulsion of silver iodid. Kelly and Lewis also advised its use. There was still a good deal of dissatisfaction with these

solutions and Burns advised using a 10 per cent solution of thorium nitrate which was a clear colorless solution hence more easily handled much cleaner and because of its high atomic weight the resulting pyelograms were of much better quality than those obtained with the earlier drugs used Thorium however was expensive and difficult to obtain during the war These were its chief objections Minor objections were that severe reactions following its use still occurred

The use of sodium iodid and sodium bromid as well as the bromid and iodid of potash were advised later At the present time I believe most of the men are using one of the latter group of drugs For the past three years we have been using a 15 per cent solution of sodium bromid with most gratifying results This solution is easy to prepare, is not destroyed by sterilization is not expensive is clean and in my experience produces fewer reactions than any of the previously mentioned agents

The use of oxygen for purposes of pyelography was first suggested by Burkhardt and Polano and later Lichtenberg and Dieken reported a series of cases in which they had injected oxygen instead of colloidal silver This method never found favor and was soon discontinued

**Technic**—In general two methods of injection are used (1) By means of a hand syringe (2) by means of a buret

Probably the largest number of men use a glass syringe such as a Luer connect this with the ureteral catheter and make the injection Needless to say great care must be used when the syringe is employed as too great pressure may be dangerous Because so many reactions some very serious followed in injections made with the hand syringe various observers advised the use of an ordinary laboratory buret that is the gravity method The container should be placed only a very short distance above the level of the patient It would appear that this is a safer method of making the injection especially for the inexperienced

Very often the mistake is made of injecting the solution too rapidly This results in a rapid overdistention of the renal

pelvis with severe renal colic and often nausea and vomiting. It cannot be emphasized too often or too forcefully that the solution must be injected very slowly. In obtaining a pyelogram it is desirable to have the pelvis full but one should avoid overdistending the pelvis. The solution should be injected just to the point of fulness or discomfort in the region of the kidney but one should stop short of the production of pain.

**Dangers**—Pyelography is not free from danger nor is this a fool proof method or is it one to be carried out just to be doing something for the patient. These dangers may be discussed under the dangers to the kidney and the dangers to the patient.

The dangers to the kidney itself probably are not as great today as they were prior to the use of sodium bromid or iodid. The real dangers were present in the days when the colloidal silver was used although one must again add that in a large measure the bad results were probably due to *errors in the technic*.

In some of the kidneys that were removed following pyelography deposits of silver were found in the parenchyma of the kidney with resulting destruction or necrosis of kidney tissue. Deposits of collargol have been found in the malpighian bodies and between the tubules.

In 2 cases in which the kidneys were removed following pyelograms made elsewhere I have seen the presence of very large wedge shaped infarcts. Cases have been reported in which the colloidal silver was found outside of the kidney that is in the perirenal fat.

**Dangers to the Patient**—Certain reactions may result from pyelography the most frequent being pain. This may at times be so severe as to require repeated hypodermic injections of morphin. The pain is generally referred to the renal area. It is not rare to see this severe pain persist from twelve to twenty four hours so that the patient is forced to stay in bed. Reflex nausea and vomiting may occur but they are rare. As stated previously it is my impression that the complications of pye-

lography may often be the result of too rapidly injecting the solution into the kidney pelvis

Chills and fever may follow the injection. This I believe is not due to the injection *per se* but due to the fact that as a result of the injection an existing infection lights up. If it is possible to demonstrate particles of collargol in the renal parenchyma following injection it is reasonable to assume that if infection is present in the pelvis the micro-organisms present in the pelvis can be carried into the substance of the kidney resulting in an acute pyelonephritis. This I believe is the real explanation of the chills and fever that sometimes follow pyelography.

Fatalities have been reported and should be borne in mind.

Severe jaundice following pyelography I have seen twice—once appearing after injecting a very large hydronephrosis with thorium nitrate. The hydronephrosis was a very large one and was not recognized before the injection was made. The second followed the injection of a small hydronephrosis.

Anuria—Suppression of urine has occurred after bilateral pyelography and fatal cases are a matter of knowledge. Partly due to this serious complication some urologists never do a double pyelogram.

In order to prevent some of the untoward results of pyelography various men have advocated the use of small ureteral catheters so that when the pelvis is fully distended the excess of fluid will flow down the ureter alongside the catheter. This in my hands has been a most helpful addition to the technic.

Not only should one avoid overdistention of the pelvis but one should inject the fluid slowly since rapid distention is more apt to be followed by both the local and general reaction.

Pyelography is a very valuable diagnostic aid in renal and ureteral surgery and the complications and dangers should always be borne in mind. When carefully carried out the danger can be reduced to a minimum. It is not uncommon to have patients react after an ordinary cysto-copy and ureteral catheterization without pyelograms so that one must differentiate

pelvis with severe renal colic, and often nausea and vomiting. It cannot be emphasized too often or too forcefully that the solution must be injected very slowly. In obtaining a pyelogram it is desirable to have the pelvis full but one should avoid overdistending the pelvis. The solution should be injected just to the point of fulness or discomfort in the region of the kidney but one should stop short of the production of pain.

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Fig 423 —Shows the presence of a double pelvis.

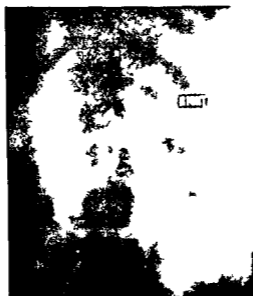


Fig 424 —Double pelvis

Another case is that of a young man who came in with pus and colon bacilli in his urine and a history compatible with acute infection in the genito-urinary tract. Cultures of his urine showed colon bacilli and microscopic examination of hi

urine showed pus. Shadowgraph catheters were passed and pyelograms were made. Cystoscopy showed the bladder to be normal and the ureteral orifices in normal position. Examination of the pyelogram shows that the right catheter passes out rather further than normal. The left catheter passes upward and when it reaches a point opposite the pelvic brim it turns sharply to the right. Pyelogram of the right side shows the pelvis of the kidney to be dilated and situated just above the crest of the ilium. The left side shows the left pelvis in the right iliac fossa near the median line. The patient therefore has a unilateral or solitary kidney, that is he has his mass of renal tissue on the right side and no kidney tissue on the left side. This case will be reported in detail elsewhere.

These cases of course are very rare and the cases reported in the older literature are all or nearly all autopsy specimens. Pyelography combined with shadowgraph catheters is an extremely valuable aid in the recognition of this anomaly.

**Hydronephrosis**—The value of pyelography in the diagnosis of early hydronephrosis can hardly be overemphasized. In cases of large hydronephroses in which the hydronephrotic sac is distended with urine the problem of diagnosis is relatively easy. As a matter of fact we rarely make pyelograms in cases of large hydronephroses if we can recognize the hydronephrosis without this aid. Our reason for this is based on the fact that these large hydronephrotic sacs do not empty themselves and they retain the media used which results in rather severe reactions as well as resulting in much pain in the kidney. This was particularly true in the early days of this work when various colloidal silver salts and thorium were used. Since using sodium bromid solution our reactions in general as well as in large hydronephroses are less severe and less frequent. In spite of the previously mentioned rule we occasionally do inject a large hydronephrosis which for some reason or other was not recognized before pyelograms were made and in these we believe we are having less reactions with sodium bromid than with other solutions. This however does not justify our deviating from the rule not to inject large hydronephroses.

The first pyelogram of a hydronephrosis that I wish to show is that of a woman who was referred to me because of pain in the back and pus in the urine. Examination of the pyelogram shows a small hydronephrosis the pelvis being low that is opposite the third lumbar vertebra. The interesting feature of this pyelogram is the fact that the mesial margin is rather sharp. Careful inspection of the pyelogram shows the inner part of the pyelogram rests against the psoas muscle which happens to be very easily visible. I have repeatedly noted this



Fig. 425—Pyelogram in contact with psoas muscle

phenomenon and believe that this type of picture is due wholly to contact with the psoas muscle (Figs. 425-426).

The next pyelogram that I wish to show is one of a patient who had pus and colon bacilli in the urine and in plain x-rays a small group of shadows just above the crest of the ilium was noted. This pyelogram (Fig. 427) shows a rather extensive hydronephrosis and the shadows are almost obliterated by the sodium bromid solution. It is clearly evident therefore that these shadows are in an enlarged and dilated kidney. The ureter also shows a great deal of dilatation.



F g 429



F g 430—Hyd u t      Extra t ral h d w      l f t d

impinges upon the artery and the presence of the aberrant artery is incidental and has nothing to do with the production of the hydronephrosis (Fig 429)

Often in making a pyelogram attempts are made to include the ureters and when this is done one very frequently is rewarded by the demonstration in the ureter of definite pathology.

The pyelogram that I am about to show you next is that of an elderly woman who had frequency pain on urination pain in the back and hypertension. Plain  $\tau$  rays showed the presence of a shadow in the bony pelvis because of which a provisional diagnosis of stone in the ureter was made. Shadow graph catheters were passed a ureterogram was made which showed the shadow under discussion as outside the ureter. Both ureters appeared enormously dilated (Fig 430).

**Tumors**—Nowhere in the entire realm of urologic diagnosis does pyelography play so important a role as it does in the diagnosis of tumors of the kidney. I refer particularly to the early diagnosis of renal tumor. When the tumors are large and can be diagnosed by palpation the prognosis is usually bad. Our problem here as elsewhere is that of early diagnosis. We feel that in the early recognition of renal neoplasms pyelography plays a most important role.

The first pyelogram shows definite changes in the superior calyx. The calyx has lost its shape and appears frayed out as it were. From this pyelogram coupled with the fact that the patient had bloody urine from this kidney a diagnosis of hypernephroma was made an immediate operation was performed and the diagnosis verified (Fig 431).

In contrast to this pyelogram which shows its disturbance as located around one of the calices I wish to present this pyelogram made to determine the origin of a large tumor in the abdomen. The presence of the tumor with a severe anemia led to a diagnosis of an inoperable hypernephroma. In order to verify the clinical diagnosis this pyelogram was made. In looking this over one sees the shadowgraph catheter stopping at a point opposite the brim of the pelvis. Passing inward from here to the transverse process of the second lumbar one obtains a rather sharp outline of the ureter. Beyond this point it is impossible to get any of the sodium bromid solution. In this instance the tumor has completely invaded the kidney pelvis.



F g 131—Hyp pl m



F g 432—Hypem ph ma

so that no pelvic cavity remains and hence no pyelogram in the true sense of the word can be obtained (Fig 432)

In the diagnosis of tumors primary in the renal pelvis pyelography has given us most valuable information

**Renal Tuberculosis**—As a rule pyelograms are not made in cases in which a diagnosis of renal tuberculosis can be made. In other words if from the cystoscopic examination, ureteral catheterization and bacteriologic examination of the urine a diagnosis of unilateral renal tuberculosis is established we do not carry out pyelography.



Fig. 433—Bilateral renal tuberculosis

There are circumstances however in which one feels that pyelography can be carried out and we wish to show a few of these pyelograms.

The first pyelogram is that of a boy aged eleven who had frequency, pus and tubercle bacilli in the urine (Fig. 433). Cystoscopic examination showed a very severe tuberculosis of the bladder. Ureteral catheterization showed the presence of tubercle bacilli in the urine from the right side. The opening of the left ureter could not be found. It was decided therefore to do a cystogram which shows the presence of a hydronephrosis on one side and changes in the inferior calyx on the opposite

side From this cystopyelogram a diagnosis of bilateral renal tuberculosis was made

The next pyelogram was made before tubercle bacilli were isolated from the urine The patient was a boy of fifteen who had unilateral pyuria Tubercle bacilli could not be found in the urine and it was decided to do a pyelogram which shows the presence of a stricture of the ureter and very definite changes in the superior middle and inferior calices (Fig 434) Tubercle bacilli subsequently were found in the urine from the right kid



Fig 434—U l t 1 l t b 1

ney and a nephrectomy performed which substantiated the diagnosis

**Renal Calculi**—In the ordinary routine of our work we do not make pyelograms in cases of stone in the kidney or stone in the ureter unless this be for some special reason For example if the patient has a shadow that lies in an area apparently outside of the normal kidney area and one wishes to determine the origin of this shadow producing body one is then justified in making a pyelogram I do not refer to this group of cases

What I refer to is the usual case of stone in the kidney and in the pelvis of the kidney in which from the Roentgen ray plates one is justified in making a diagnosis of stone in the kidney

Pyelography is of value in bringing out certain stone shadows that do not show up well in the roentgenogram and as an example of this I should like to show the following pyelogram (Fig 435)

The patient complained for many years of pain in the back and occasionally she noticed her urine was bloody. A plain



Fig 435 —Calculus in inferior calyx

x ray was made and showed the presence of a faint shadow opposite the transverse process of the fourth lumbar vertebra. The shadow was discerned only after very careful plate reading. The question of the location of this shadow was discussed and it was decided to do a pyelogram which proved to be very interesting. The shadow was shown to be in the inferior calyx and it is recognized by the fact that this part of the pelvis is lighter than the rest of the pelvis.

This procedure that of bringing out kidney stone shadows which do not show very well in plain plate was reported by

Graves of Boston a short time ago and is the opposite of the procedure advised by Kummel many years ago that of injecting into the kidney pelvis a solution of collargol in order to increase the density of the stone

**Polycystic Disease of the Kidney**—This disease of the kidney as usually met with is not difficult of recognition because of the presence of enlargement of both kidneys. However occasionally one might be justified in performing a pyelogram to differentiate various lesions (Fig 436)



Fig 436—Polycystic disease of the kidney

**Stricture of the Ureter**—The next two pyelograms are interesting as showing the presence of stricture of the ureter due to disease in the female pelvic organs

The first pyelogram is that of a woman of fifty whom I had occasion to see four or five years ago with an attack of *colon bacillus pyelitis*. She again consulted me because of the presence of backache and frequency which symptoms she attributed to a return of her old trouble. A pyelogram was made and this shows the presence of a small hydronephrosis and an enormous dilatation of the ureter (Fig 437). A subsequent



Fig 437—Ureter stricture due to primary carcinoma of the right ovary



Fig 438—Ureter stricture due to tuberculosis of both ovaries and tubes

operation revealed the presence of a primary carcinoma of the right ovary which accounted for the stricture of the ureter and the hydronephrosis

In the second case the stricture was due to the presence of tuberculosis of both ovaries and tubes (Fig 438)

Often one is confronted with the problem of determining whether an abdominal tumor is of renal or extrarenal origin. On the left side this problem concerns chiefly a differentiation between lesions of the spleen and lesions of the kidney. As a rule the blood picture gives one a clue. However there are certain instances in which this aid fails us.

The pyelogram that I wish to show now is of a young woman who came in because of the presence of a tumor mass in the left upper quadrant. An examination of the abdomen showed the presence of a swelling about twice the size of a normal kidney. Various consultants were called most of whom thought the enlargement was due to the kidney particularly as the blood picture was normal. A pyelogram was made and this showed a normal pyelogram. As the pyelogram was normal I made a diagnosis of extrarenal tumor probably spleen. It was difficult for me to reconcile myself to the fact that the pyelogram was normal in the presence of this enlarged mass. At operation the kidney proved to be normal and an enlarged spleen was found.

Lesions of the liver and biliary tract occasionally call for differentiation.

The pyelogram that I wish to show you now is that of a young man who had both gastric and urinary symptom. Subsequent examination showed that his urinary symptoms were due to a colon bacillus infection. A plain Roentgen ray showed the presence of three shadows. From the position of these shadows a diagnosis of renal calculi had been made although from the plain ray I made a diagnosis of gall stones because careful inspection of these shadows showed they had a light center but in order to differentiate between renal calculi and gall stones in an extremely long gall bladder a pyelogram was made and as you see this shows the kidney pelvis to be normal in size and position and a diagnosis of gall stones was verified later (Fig. 439).

The next pyelogram I wish to show is one of a woman who had an enlarged mass on the right side the origin of which was not clear. A tentative diagnosis of enlarged right lobe of the liver was made. In order to exclude the possibility of a renal



Fig 439 —Gall stones



Fig 440 —Normal pyelogram Note prolapsed liver

tumor a pyelogram was made and this showed a normal pyelogram and in this picture we were fortunate enough to obtain a rather sharp outline of the tumor under discussion which showed it to be a prolapsed liver (Fig 440)

Many more examples of these types of extrarenal tumor could be cited

Other lesions of the liver call for differentiation from the kidney. Recently this problem arose in a case of carcinoma of the liver in a woman of sixty who had a profound anemia and an enlarged palpable mass on the right side. The pyelogram was normal from which the renal origin of the tumor mass was excluded. At operation a primary carcinoma of the liver was found.

Lesions of the pancreas may occasionally be confused with renal lesions and call for differentiation which can very easily be established by means of pyelograms.

From the foregoing cases it is seen that in handling these problems of differentiation between tumors of renal and extra renal origin we have had most gratifying results with pyelography.

## CLINIC OF DR DANIEL N EISENDRATH

MICHAEL REESE HOSPITAL

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### TUMORS OF THE KIDNEY

Hypernephroma of the Left Kidney    Value of Pyelography  
in Early Diagnosis of Renal Neoplasms    Technic of Removal  
of Tumor    Discussion of Renal Neoplasms

THIS patient was operated on November 13 1922 for a hypernephroma of the left kidney My reasons for presenting her are to direct your attention to the possibility of making an early diagnosis of a renal neoplasm by pyelography and also to emphasize the necessity of the employment of an operative technic which enables one to ligate the renal vein before mobilizing the tumor itself a necessary procedure if one wishes to avoid forcing some of the tumor thrombus into the vena cava

THIS woman is forty four years old and consulted me because of pain in the left upper quadrant of the abdomen accompanied by progressive loss of weight and strength This pain began eleven months before being seen by me and varied greatly both in intensity and duration For the past six months there have been a number of distinct attacks of this pain most marked over the left ilio-costal space During the entire period there has been a slight rise of evening temperature but a complete absence of any disturbances of urination and of hematuria Her previous history was negative and upon physical examination nothing abnormal was to be found except tenderness over the left kidney only the lower pole of which was distinctly palpable at the level of the umbilicus This lower pole felt smooth and presented a normal rounded contour

A urologic study revealed the following By ordinary radiog

raphy one could see the shadow of a somewhat enlarged kidney but of normal outline. There were no changes in the bladder mucosa but a moderate injection of the lips of both ureteral orifices. No obstruction to a No. 6 catheter was encountered in either ureter. There was an excretion of 9 c.c. of urine in seventeen minutes from the right kidney but none escaped



Fig. 441.—Pyelogram of a reported lithiasis. It shows a filling defect of upper calyx due to a hyperplasia of papillary tissue.

from the left ureteral catheter after forty-five minutes. Phthalein appeared in concentrated form in nine minutes on the right side but none on the left side. Microscopic examination showed a few leukocytes in the right urine but no specimen was obtained from the left side.

Pyelography (using a 12 per cent solution of sodium iodid) revealed a typical filling defect involving the upper calyx of

the left kidney (Fig 441) a crowding downward of the remaining calices and a marked kinking of the ureter close to the renal pelvis. Our preoperative diagnosis was tumor of the upper half of the kidney which had invaded the pelvis and produced the filling defect and displacement downward of the entire kidney.

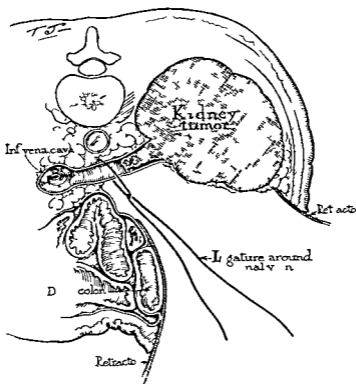


Fig 442 —This illustration shows the principle upon which the operation for removal of renal tumor is based. The peritoneum and intraperitoneal viscera have been retracted toward the median line, the renal pedicle isolated with a ligature placed around the renal vein as close as possible to the vena cava beyond a tumor thrombus which has extended into the renal vein.

At operation on November 13, 1922 the usual lumbar kidney incision (Fig 443 B) was made. Upon exposure of the perirenal fat a large number of very much dilated veins (Fig 444) was seen. After ligating several of these one was able to see the surface of the kidney which was the size of the adult head extending far upward under the left dome of the diaphragm and presenting on the surface at the junction of the two halves.

several of the yellowish firm nodules so characteristic of a hypernephroma. In order to secure access to the renal pedicle especially its veins in order to prevent the propulsion of a possible tumor thrombus (Fig. 442) into the vena cava and from here into the general circulation it became necessary to employ a technic which would enable me to ligate the pedicle first before beginning the mobilization of the tumor itself.

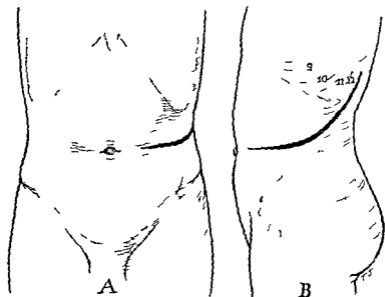


Fig 443—*A* Ete of d ary n phre tomy au: forward to o t bord of r tus mus le eth r sd The bd mu l muscles are in sed d wn to the pe t eum wh h d pl ced nw d to the ol Com pa with *B* *B* Lat al view The dotted line shows xte on downward of u al kidney in on wh h som tted and pl d by trans ers ncis ext d g to o t bo d f e the t s muscl (C mpa w th *A*)

After the patient was placed in the full dorsal position an incision was made transversely (Fig 443 B) to the outer border of the left rectus muscle as an extension of the original lumbar incision (Fig 443 A). Upon reaching the parietal peritoneum it together with the descending colon was pushed inward (Fig 444) almost to the midline of the body. It is surprising how easily this can be carried out without opening the peritoneum.

oneal cavity The entire tumor with its dilated perirenal veins (Fig 444) was now exposed and the renal pedicle was accessible without disturbing the position of the tumor A possible tear of the peritoneum was avoided by placing thick gauze pads between it and the retractors The renal vein which was the size of the adult little finger was isolated and ligated with kang

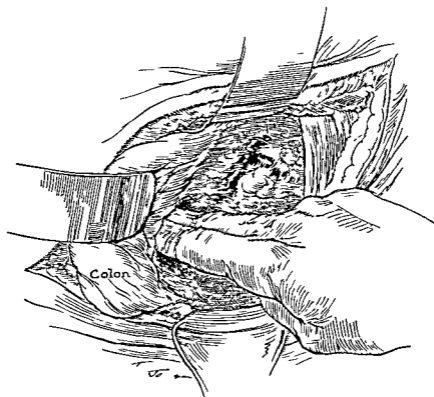


Fig 444—This illustration shows how the peritoneum and colon are pushed toward the median line so as to expose the renal vessels The peritoneum has not been opened or the kidney tumor mobilized Note the varicosities in the perirenal fat over the kidney tumor

aroo tendon as close as possible (Fig 445) to the vena cava A second ligature was applied nearer the hilus of the kidney to prevent the escape into the wound of particles of a possible extension of the tumor into the vein The renal vein having been divided between these two ligatures the renal artery was next taken care of and search made for accessory vessels to the upper and lower poles

The removal of the renal tumor from its bed was now accomplished without any loss of blood or danger of forcing tumor particles into the circulation. The closure of the wound in the parietes presented but little more difficulty than that of the ordinary lumbar incision (Fig 443 B). The gross appearance of the removed kidney (Fig 446) confirmed the diagnosis of a neoplasm involving the upper two thirds of the organ. On the surface there were a number of yellowish brown nodules

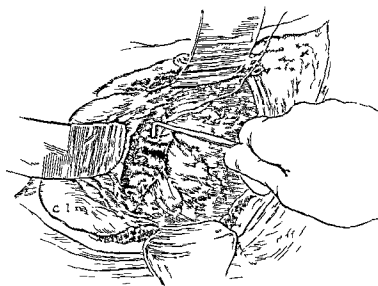


Fig 446—The kidney removed from the body of the patient. The tumor was found to be a large, solid, yellowish-brown mass, occupying the upper two thirds of the kidney. (Compare the previous figure.)

and on section in addition to considerable degeneration in the upper part of the tumor one could see an extension into the upper half of the renal pelvis (Fig 446).

The pyelographic medium could not displace this solid in growth and hence the filling defect in the pyelogram. The fact that the tumor occupied the upper two thirds of the kidney also explains the crowding downward of the lower calices. As the tumor developed it also pushed the remaining portion

of the kidney and its pelvis downward which explains the presence of the link (Fig 441) as seen before operation

The microscopic examination by Dr B Portis confirmed the diagnosis of hypernephroma. There was considerable hemorrhage into and necrosis of the neoplasm. The patient has made an uneventful recovery thus far. The wound healed by primary union and there is no bulging upon coughing of the abdominal wall in the vicinity of the large incision.



Fig 446 — Appearance of a kidney in which upper two thirds is the seat of a hypernephroma. Note a portion of the tumor growing into upper or calyx of renal pelvis. (Compare with pyelogram of same case shown in Fig 441.)

Looking back over the clinical history and operative findings certain features stand out. These are the absence of hematuria and of a palpable enlargement of the kidney which as you know constitute two of the triad of conditions so frequently found in neoplasms of the kidney. The only symptom which led one to suspect some lesion of the upper urinary tract was the presence of pain over the left upper quadrant of the abdomen.

and over the rhocostal space of the same side. Neither cystoscopy nor ureteral catheterization were of aid in making a diagnosis. The latter was based exclusively upon the presence of a filling defect in the pyelogram (Fig. 441) which we have learned to interpret as due to the invasion of the renal pelvis by a tumor.

Both benign and malignant neoplasms can give rise to changes in the outline of the pyelogram so that one cannot state definitely the nature of the underlying cause of the distortion at least in the early stages from the pyelogram. Let us review briefly some of the more important observations upon the subject of renal neoplasms especially those relating to the clinical side. The first to be considered is the variety of tumor.

In this subdivision one immediately encounters as elsewhere in the body an anomalous situation. A comparatively frequent form of enlargement is that known as polycystic kidney which develops as a rule in both kidneys and sooner or later causes an atrophy of the parenchyma between the individual cysts as effectually as though it had been invaded or pushed aside by a neoplasm of the malignant type as shown in today's case. There are a few supporters of the theory that the condition may be a unilateral one but I will not speak of this here as the entire subject has been taken up in a previous clinic.<sup>1</sup>

For clinical purposes it is important to know that these cases of congenital cystic kidney present themselves under the same clinical picture as is true of neoplasms such as carcinoma and hypernephroma. By this I mean that the presence of a tumor of hematuria and of pain yes even changes in the outline of a pyelogram are as characteristic of a congenital polycystic kidney as of one of the varieties of tumor which we generally understand as belonging to the true neoplasms. If the cystic change are predominantly unilateral it is often impossible to make a diagnosis before operation. Never fail to palpate the opposite kidney and have a pyelogram made no matter how typical may be the change on the side suspected.

to be the seat of the neoplasm. In a recent case<sup>1</sup> the pyelogram and palpatory findings were thought to be typical of a hypernephroma until we found that the opposite kidney was the seat of a less marked nodulated enlargement and a pyelogram of this side revealed similar changes in the pelvic outline

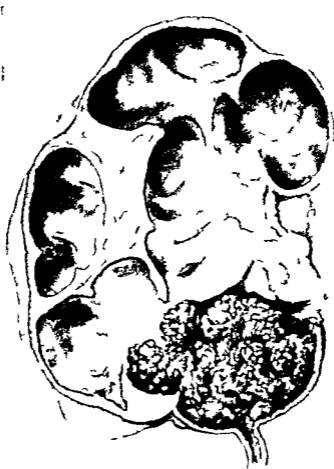


Fig. 447 —Large papilloma of renal pelvis causing hydronephrosis. (After Brutt)

Having directed your attention to these cases of polycystic kidneys which as Berner has shown are due to a lack of union of two portions of the urinary tract let me mention those forms of renal tumors to which we refer when we speak of neoplasms

<sup>1</sup> This case will be reported later in connection with the pyelographic diagnosis of polycystic kidney

For clinical purposes I have found that the following division of true renal neoplasms is the most useful

1 *Primary neoplasms of the parenchyma*

Epithelial type

(a) Adenoma

(b) Carcinoma

Connective tissue type

(a) Benign—fibroma myxoma chondroma leiomyoma and rhabdomyoma angioma

(b) Malignant—sarcoma

(c) Embryonal adenomyosarcoma—also called teratomata or mixed cell tumors

Neoplasms due to misplaced adrenal rests—hypernephroma

2 *Primary neoplasms of the renal pelvis*

Epithelial type

(a) Papilloma

(b) Papillary carcinoma

(c) Epithelioma (squamous celled)

Every one who expects to be able to interpret the clinical pictures under which these neoplasms present themselves should have at least a working knowledge of the chief pathological features of each of these varieties of tumors hence I will stop to consider them briefly

**Adenoma of the Parenchyma**—This rarely gives rise to clinical symptoms because it is very small (pea to bean size) and lies in the cortex as a circumscribed whitish tumor. Occasionally one finds a multilocular cystadenoma similar to that found in the ovary. I removed such a kidney from a child of four (Fig. 448).

**Carcinoma of the Parenchyma**—The majority occur in adults only a few having been found in children. They arise from the secreting tubules and may present histologically either the features of a papillary or an alveolar adenocarcinoma. They may be nodular with a distinct capsule or invade the parenchyma in a diffuse manner (Fig. 449). They may invade the renal pelvis (Fig. 449) and grow into the veins and regional

lymph nodes but the latter two complications occur at a much later period in the history of the growth than is the case in both hypernephroma and sarcoma

**Benign Connective tissue Type Neoplasms**—Of these the only one of clinical interest is the angioma which can give rise to severe bleeding when located at the tip of a papilla

**Sarcoma**—This is the most common type of tumor in children It is usually of the round or spindle celled variety grows very rapidly and invades the veins at a comparatively

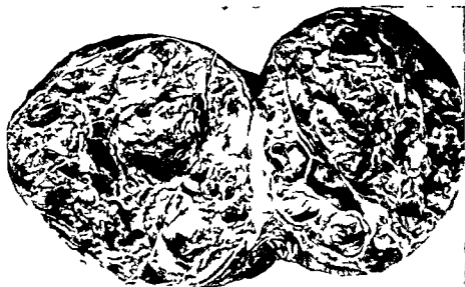


Fig 448 —Cystadenoma of kidney removed from a child of four years simulating clinically a sarcoma of the kidney Note remnant of kidney tissue at lower pole of tumor

early period Many of the tumors reported as sarcomata in children in reality belong to the group of teratoids or mixed cell tumors there being a predominance of cells of the round or spindle type

**Embryonal Adenomyosarcoma**—Also Called Teratoids, and **Mixed cell (Wilms) Tumors of the Parenchyma**—These rarely occur in adults They resemble similar neoplasms of the testis<sup>1</sup> and salivary glands and may reveal histologically almost every

type of tissue as found in the embryo. According to the predominance of one or other type of cell the histologic picture may be that of an adenoma or carcinoma at one time and of a sarcoma at another. The majority contain striped and unstriped muscle fibers.

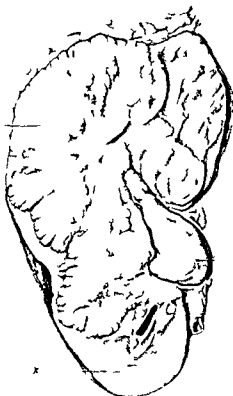


Fig. 449.—Carcinoma of kidney. Note how neoplasm (*N*) extends into retroperitoneum (*NP*) and may obstruct ureter. Normal kidney seen at *K* (Legueu).

**Hypernephroma**—The case presented in today's clinic belongs to the group of tumors due to the inclusion within the kidney of islands of tissue resembling in histologic structure that of the normal adrenal cortex. Clinically it is of importance to know that the majority are found in the upper pole that

they constitute about 60 per cent of all renal neoplasms that they grow into the venules and from here into the main renal vein at a comparatively early stage, and finally that they are particularly prone to undergo retrogressive metamorphosis such as cyst formation necrosis, and hemorrhage Invasion of the renal pelvis also occurs quite early (Fig 446) thus giving rise to hematuria either directly or indirectly as the result of passive congestion the blood escaping into the tubules and from there into the pelvis

**Papilloma and Papillary Carcinoma of the Renal Pelvis**—These types of tumors resemble in every respect the similar ones found in the urinary bladder There can be no question that the influence of infection plays a great part in the development of these tumors Of 57 cases collected by Darrell calculi were found in 10 and infection in 10 cases Just as tumors of the parenchyma invade the pelvis so those which are primary in the latter structure may either grow into the parenchyma or cause a hemato or hydronephrosis (Fig 447) by obstructing the ureteropelvic junction

Another feature especially characteristic of papillomata of the renal pelvis is the tendency for secondary implantations to occur in the ureter and bladder Of 57 cases (Darrell also Miller and Herbst) the ureter was also involved in 25 while in 18 the kidney ureter and bladder were the seat of growths Every papilloma of the renal pelvis is capable of malignant changes hence it is impossible before operation to state whether one is dealing with a benign or malignant papilloma

**Squamous celled Carcinoma of the Pelvis**—These are comparatively rare although there can no longer be any doubt that they occur chiefly as the result of chronic inflammatory proliferative changes The tumor is usually quite large when discovered but even a small growth may cause early obstruction of the outlet of the renal pelvis This form of neoplasm must be differentiated from a leukoplakia of the pelvic mucosa or a cholelithomatous condition as is found at times in tuberculosis and calculi

**Symptoms and Diagnosis**—Until recently we were obliged

to base our diagnosis of kidney tumors upon three cardinal symptoms namely tumor pain and hematuria. Concomitant with the rapid development of urologic diagnosis especially of pyelography we are able to recognize the presence of a neoplasm of the kidney at a much earlier period in the clinical history than was formerly the case. I will enumerate and briefly discuss the value of the various data upon which we rely at the present time.

## HEMATURIA

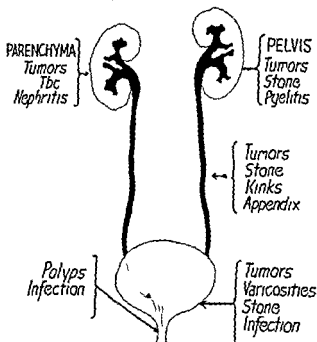


Fig 450 — Diagram showing various causes to be considered differential hematuria

**Hematuria** — This occurs as an initial symptom in 30 to 66 per cent of the cases according to statistical tabulations of various authors. It occurs as an associated symptom that is either with pain, tumor, etc. in an average of 78 to 80 per cent of all cases. There is a great variation in the duration and severity of the hematuria and the same is true of its tendency

to recurrence. As a rule the urine contains far more blood in the case of a renal neoplasm than in any other cause of hematuria (Fig 450) except perhaps a papilloma of the bladder. There are exceptions however to this rule. I saw a case of severe granular pyelitis complicated by a pyelonephritis in which the clots and liquid blood simulated a hematuria due to a neoplasm. Another exception is in the case of congenital cystic kidney where a severe hematuria may occur as an initial symptom as is the case in true neoplasm. The passage of clots is responsible for the colicky pain to which I will refer later. It is of interest to note that a severe hematuria may follow an injury to a kidney which is the seat of a neoplasm and the same is true of a ureteral catheterization. In the majority of cases the hematuria is the result of an extension of a tumor of the parenchyma into the pelvis or of a primary growth into the pelvis proper such as a benign or malignant papilloma. I cannot emphasize too strongly the fact that when a patient presents himself complaining of one or more attacks of hematuria it is necessary to make a complete urologic study as to the source of the bleeding. There are many causes in the upper urinary tract (Fig 450) which are in no way related to a neoplasm. I refer to chronic nephritis, granular pyelitis, congenital cystic kidney, calculi and rarely to hydronephrosis. In some cases the bleeding may be due to passive congestion of the renal tissue in the vicinity of a tumor which has not extended into the pelvis, the blood escaping into the tubules and from here into the renal pelvis.

*Pain*—The pain in the majority of cases is of a dull aching character as was complained of by our patient of today's clinic. It is located as a rule over the side where the neoplasm is situated. Such a dull aching pain was found by Hyman as a primary symptom in 40 per cent of 28 cases and was an initial symptom in the Hochenegg Clinic at Vienna in 44 per cent of a large number of cases. The pain may be of a neuralgic character referred along the course of distribution of the ilio inguinal and iliohypogastric nerves. Next in frequency is a type of pain which simulates that of a typical renal colic. It is due to the

passage of clots along the ureter and can be at once differentiated from the other causes of ureteral colic by finding relatively large or worm like clots in the urine

*Tumor*—In adults the presence of a tumor is seldom an initial symptom. This is especially true of the cases where the neoplasm has developed in the upper half of the kidney and is difficult to palpate. In children however the presence of the tumor is often the first finding. The tumor is felt at some period or other in about 85 per cent of all cases. In both adults and children it is especially important to palpate the opposite kidney because true neoplasms may occur simultaneously in both kidneys. The value of such palpation was impressed upon me by a recent case in which a pyelogram showed a typical deformity and on palpation one felt a much enlarged hard nodular right kidney. Upon examining the left side a similar condition was found and pyelogram confirmed the diagnosis of a congenital cystic condition in both kidneys.

*Left Varicocele*—This occurs so rarely that but little reliance can be placed upon its absence. It is due to the extension of a tumor thrombus into the renal vein so as to obstruct the return flow from the left spermatic vein. It was found to be present in 15 per cent of the cases of hypernephroma reported from Hochenegg's clinic but this is an exceptional finding.

*Fever*—Some surgeons with large experience in this field like Israel and Illyes regard the presence of fever as typical of a tumor but this view is shared by few others. It may last for months rising to 104° F every evening as in a case recently reported by Scheele. In a sarcoma occurring in a young infant and operated by Doctors Harsha and Lawrence of this city the presence of persistent fever (Fig 451) led to a diagnosis of appendical abscess. In the case reported in today's clinic the patient had an evening rise of temperature to 100° F and this led us in an analogous manner as in the case shown in Fig 452 to think of a possible renal infection. The fever is considered to be due to an anaphylaxis as a result of entrance of parts of the tumor into the circulation.

*Solitary Metastases*—The most frequent location of second

ary growths is in the lungs long bones sternum skull and spine and although they occur less frequently in children than in adults one must bear this condition constantly in mind when a diagnosis of a primary bone tumor is made In the case of hypernephromata the metastasis is often discovered months or even years before there are localizing symptoms referable to the kidney

*Reflex Ileus*—My reason for directing your attention to this syndrome is that one may encounter cases in which the

### Tumor of Kidney with high fever

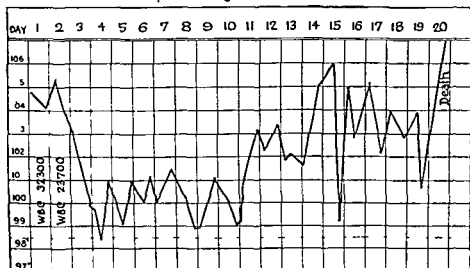


Fig 451—Temperature chart from case of sarcoma of the kidney in child of four with high fever simulating appendical abscess (Case of Dr Lawrence)

predominating symptoms are those of an acute ileus This may be due to a massive hemorrhage into a tumor or the passage of clots from the kidney to the bladder It is a purely reflex condition and due to the intimate relation of the renal and intestinal innervation

*Urologic Study*—The principal features of interest in this portion of the diagnosis are the ability to see blood escaping from the ureter of the affected side and less frequently the presence of a papilloma protruding through the ureteral orifice

Aside from this the cystoscopic examination presents no characteristic features. Of greater value is the interpretation of the ureteropyelogram and the functional tests. In regard to the latter one must always suspect the presence of a neoplasm when there is marked diminution or even absence of excretion



Fig. 452.—Pyelogram of the right kidney showing a large, irregular, filling defect in the upper pole, consistent with a renal neoplasm. (K. d. l. by D. D. g. and Z. g. l.)

of dyes from the affected side. In regard to pyelography I cannot emphasize too strongly the great value of this method of examination. In the case presented today it enabled us to make a diagnosis of renal neoplasm in the absence of any other symptom except pain and slight evening rise of temperature. The principal changes in the pyelogram are (a) The presence

of a filling defect (Fig 441) (b) the distortion of the outline of the calices until the so called spider form (Fig 452) is attained and (c) the presence of a hydronephrosis due to obstruction of the outlet of the renal pelvis (Fig 447) Of course there is nothing pathognomonic in the hydronephrosis due to a neoplasm but when it is associated with distortion of the renal calices and hematuria it is at least suspicious

**Treatment**—The ideal method of treatment would be to do a bloc removal of the kidney itself its fatty capsule and the lymph nodes at the renal hilus and to ligate the renal vein first before mobilization of the kidney (Figs 442-445) The veins were found involved in 13 of 86 hypernephromata by Bloch and in 4 of 19 by Wright Hence our first consideration should be to prevent the transmission into the general circulation of a tumor thrombus (Fig 442) Rehn has proposed attacking cases in which the tumor has extended into the vein and even into the vena cava by radical method In one case he resected a portion of the vena cava itself with the tumor thrombus successfully

The ordinary lumbar incision does not always suffice to render it possible to carry out the ideal bloc removal of renal tumors Kronlein and later Gregoire suggested a paraperitoneal route in which the colon and unopened peritoneum are displaced inward (Figs 442-444) so as to enable the renal vein to be ligated before the tumor is mobilized (Fig 445) Bazy has suggested a transverse incision where Kronlein and Gregoire utilized a trap-door like incision In the case which I have presented in today's clinic I began with the usual kidney incision (Fig 443 B) but on account of the fixation of the tumor and inaccessibility of the renal vein I employed the technic described by Kronlein and extended the incision to the outer border of the right rectus muscle to displace inward the transverse colon and unopened peritoneum And I can warmly recommend this technic if one wishes to ligate the renal vessels before attempting to deliver the tumor itself One cannot determine except by direct palpation of the main renal vein whether a tumor thrombus is present or not and I believe we

of them are of the opinion that the ulcer ought to be given a chance to heal under medical treatment and then if there is no good result to treat it surgically

It is of great value to review from time to time the active state of affairs and to induce the surgeon who has failure and *disappointments to rectify his views change his method* and to the medical man who has the mortifying experience of losing cases by hemorrhage or to hear the verdict too late because of procrastination by him to reform It is a good thing to review the methods as they are in vogue in the surgical centers in civilized countries and to allow the surgeons to draw their own conclusions

It has been my good fortune to visit within the last six months some of the most progressive centers (medical and surgical) abroad and watch the treatment of a large number of cases

My experience in my own practice has been that of the majority—surgical treatment after failure of medicine—a cure in a large number of cases some failures some fatalities

While visiting the best clinics of England France Switzerland Germany Austria and Italy I have observed an enormous increase of operations for ulcers of duodenum and stomach when compared with former times and strange to say in those countries where they were so reluctant to accept the existence of these pathologic condition the operations are the most frequent Two facts have impressed me more forcibly than anything else besides this increase of operations that is the use of local anesthesia and the very radical method of resection

In those clinics where the surgeons were conservative the results as I was told and as I could see myself were not as good as in the places where the radical resection was practised Gastro-enterostomy seemed to be on the Continent only practised by that group of surgeons who are followers of authority and have conservative tendencies I have seen a large number of resections after gastro enterostomy that *failed to relieve the symptoms or even produce the bad results of jejunal ulcers*

The most extensive operations on the largest number of cases I saw in Austria and again in Vienna although I was told by Professor Eiselsberg that he had just assisted in the one thousandth resection of stomach in one of his former assistant's clinics in Innsbruck. Unfortunately there was no stomach operation on the two occasions when I was in Innsbruck and I could not afford to wait but I would very much liked to have seen the work of this operator of whose work Professor Eiselsberg was so proud.

I saw in the practice of Professor Eiselsberg Dr Hans Lorenz and particularly in the practice of Professor Hans Finsterer a large number of cases. All three performed a very radical resection of the stomach for duodenal ulcer but used different methods of union of the stump with the small intestine but they particularly differ in regard to the method of anesthesia—Lorenz using general anesthesia almost exclusively and Finsterer almost exclusively the anesthesia of the splanchnic nerve. The results of all three are very good but numerically the method practised by Dr Finsterer surpasses everything I have been able to witness. Perhaps it is best to describe one of the operations of duodenal or gastric ulcer as it is performed by this surgeon. A typical case is like this.

A patient prepared like anywhere else. First locally on abdomen anesthetized with novocain then the anesthetic is injected into the parietal peritoneum where the abdominal wall is exposed. Then with a special long needle there are injected about 60 to 70 c c of a 1 per cent solution of novocain into the region between the aorta and vena cava back of the stomach and below the liver whereupon the stomach can be easily manipulated for two to three hours without the patient feeling anything even the traction of the stomach.

He operates very slowly and delicately first as a rule separating the duodenum and then the stomach way beyond the median line to the left leaving only about one third of the stomach cavity and joining the stump directly with the jejunum in the manner as Hofmeister or Polya have recommended.

These operations take him between two to three hours

medical clinic of Professor Singer of Vienna examined by fluoroscopy long after operations and observed a perfect function of the stomach several years after large resection in a case operated by Professor Finsterer. At any rate it will be interesting since these methods will find followers in our practice to observe our results.

## CLINIC OF DR ALFRED A STRAUSS

MICHAEL REESE HOSPITAL

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### ULCERATIVE COLITIS

Presentation of Two Cases of Ulcerative Colitis    Technic of Operation    Value of Surgical Interference in Chronic Cases

WE have here this morning 2 very interesting cases of ulcerative colitis. The first patient gives a history of having been treated medically for two years for diarrhea which at times became so constant that he was confined to bed for weeks. The stools the greater part of the time contained excessive amounts of blood. As you can see from the patient's appearance he is very anemic; he must have lost a great deal of blood for a long period of time. His hemoglobin is 20 and his red count is 1 300 000. He tells the story of having been under medical treatment for many months at various hospitals and he has at times improved somewhat but in the last year has been gradually becoming weaker and more pale and has lost so much in strength that now he is almost moribund. His temperature ranges from 100 to 102 F and his pulse from 100 to 130. Within the last month he has complained of what was assumed to be a pleurisy but in reality was probably an embolic affair in his lung which gave him all the symptoms of a pleurisy with effusion. This gradually disappeared. At the time of his embolic affair he had a temperature ranging up to 103 F. Within the last two weeks he also evidently got an embolus in his femoral vein and developed a typical phlebitis. His leg is swollen and painful and he has a rise of temperature. You can readily see this is one of the very extreme cases of ulcerative colitis and undoubtedly some of these infectious emboli are thrown into the circulation. So in presenting

this case it is evident that it is one of the extreme cases of chronic ulcerative colitis and a typical end result of too long continued medical treatment without surgical interference

I want to give you my idea of the relationship of medical to surgical treatment in this condition and the real value of each and what I believe is the sane way of handling such a condition. We have right now 4 cases on our hands which were treated by very competent medical men and the most modern and competent medical methods. Not one of these patients has improved one bit by this medical treatment and 3 of the 4 have become distinctly worse during the period of medical treatment. This patient here this morning in particular has practically become exhausted and gone into a state of collapse that is almost beyond repair.

The pathology of the colon in this condition is a general ulceration and infiltration of usually the lower half of the colon sigmoid and upper rectum and in many instances extends through the entire colon and even into the appendix. The colon is usually from four to eight times its normal thickness is infiltrated and its tissues hardened so it feels like a stiff rubber hose. It has an injected and reddened appearance and the mesentery is filled with numerous hardened lymph glands ranging from the size of a hazelnut to that of an English walnut. Histologically the outer walls are usually packed with round cells lymphocytes and areas of eosinophils. The inner muscular coat and submucosa are usually ulcerated. We find the typical leukocytic and lymphocytic infiltration with many round cells and eosinophils.

The etiology is not well understood but in many instances it has been shown that the predominant organisms that have been found from the washings and irrigations after the ileostomy are streptococci. The chief criticism that can be made against long and continued medical treatment is that it is physically impossible to cure such an ulcerative bowel as long as the intestinal contents are going through that bowel no matter how careful the diet and medication may be. During the time that medical treatment is being carried on which is usually

from one to two years before the medical men decide that they cannot accomplish a good result the colon is undergoing definite destructive changes of ulceration and infiltration which are bound to produce narrowing of the lumen contraction and scar tissue formation When the healing process does finally take place it produces a colon which has so many points of obstruction in it that a normal physiologic function cannot be restored Therefore I believe that the proper treatment for ulcerative colitis is early surgical intervention in conjunction with medical treatment so that the bowel can be put at rest and cure effected before these formidable and advanced pathologic changes take place For instance I think a patient who comes to you with a history of recently having had diarrhea with bloody stools for a period of four to six weeks and on x ray examination shows a typical infiltrated colon and if at the end of six weeks to two months medical treatment has not helped he then should have surgical interference If his blood count and hemoglobin are low he should have a blood transfusion We always use here the direct syringe method as I will demonstrate this morning Then I will do an ileostomy through a gridiron incision under local anesthesia

We carry out our blood transfusion as you see here with two simple needle cannulas which I have been using for some time It is a large needle about the size of a cannula which has a trocar in it is beveled at the edge the same as a spinal needle About  $\frac{3}{4}$  inch from the point is a small transverse projection through which a Cambridge needle can be placed The needle cannula is plunged into the vein the vein first being transfixed by a fine Cambridge needle When the cannula is in the vein the Cambridge needle is withdrawn and then transfixed through the vein and the small opening in the cannula so it cannot slip forward or backward The same is put into the donor We now have three 100 c c Luer syringes and two basins one of normal saline and one of sodium citrate solution The syringe is first washed with saline and then rinsed out in citrate but no citrate is left in the syringe but what will adhere to the wall of the glass syringe The blood is now drawn from the donor

and transferred to the recipient. With three syringes one is always being washed by the nurse so that we always have a syringe ready for use and the whole process of transferring 800 c.c. of blood usually takes as it did in this case about twelve minutes. I think this is a very simple and easy method of blood transfusion. It does not necessitate the cutting down and exposing of the veins as you do when you insert a cannula and allows you the use of the same donor repeatedly if necessary. It has the advantage over the citrate method in that we get practically no chill or reactions which is a very important factor in a patient of this kind who is practically in a state of collapse. The chances for infection or anything happening to the blood are much less than when you are stirring or exposing the blood to the air.

We will now get the patient ready for the ileostomy. Before doing an ileostomy I usually make a small midline incision below the umbilicus to explore and inspect the sigmoid and colon to learn the exact extent of the pathology in the abdomen but this patient being in such an extreme state of exhaustion and the diagnosis being very definite both from the x-ray and the proctoscopic examination we had better simply do an ileostomy under local anesthesia through a small gridiron incision just as we would for an appendix operation.

I now quickly infiltrate the various layers of the abdominal wall with 1 per cent novocain solution and expose the abdominal cavity. The cecum shows marked infiltration and also the ascending colon and appendix so we must assume that the entire colon up to the ileum has undergone these marked changes. As you will notice there is a marked line of arrest of the disease at the ileocecal valve and the ileum appears perfectly normal. We now pick up a loop of ileum about 4 to 6 inches from the ileocecal valve and make a knuckle of the ileum by suturing the sides of the mesenteric folds together with fine catgut to the extent of about 4 inches. This makes a typical knuckle of the ileum which is now pulled into the gridiron incision and pulled up above the skin so the knuckle will protrude above the skin for about 1/2 inch. The peritoneum is fixed all around the two loops of

bowel with interrupted catgut and the various layers of the abdominal wall are also attached. The skin is now stitched with interrupted silk to the bowel, the small skin incision closed, and the bowel covered with vaselin. The knuckle of ileum is cut across transversely within twenty-four to forty-eight hours. I have never seen any abdominal wall infection from this procedure, and the operation does not produce any shock or any untoward operative complications. Within a very few days patients are absolutely relieved of any cramps and peristaltic pain that they formerly had, and the active hemorrhage from the colon is stopped within a short while. Within five to six days after the ileum is opened, we start irrigating through the distal loop of the ileum with from 3 to 4 quarts of normal saline solution. After trying all forms of medication, such as 1:10,000 silver nitrate solutions, 1:10,000 potassium permanganate solutions, weak iodine solutions, and zinc chloride solutions, we have found that normal saline irrigations are just as efficient as any other type of irrigation, and they should be carried on twice a day by placing a tube in the rectum, not very high, and irrigating by means of a large-sized catheter through the distal loop of the ileum. It is not necessary to try and force the catheter in through the ileocecal valve. The solution will flow into the colon very readily without any discomfort or marked distention of the latter. Later on this irrigation can be increased to 6 to 8 quarts of normal salt at a time. I have one case in which we did not irrigate at all, simply doing an ileostomy, and the patient made a perfect recovery.

The next patient I would like to show you is one on whom an ileostomy was performed eleven months ago. The patient has since gained 80 pounds in weight, now weighing 180 pounds, and as you can very readily see is a robust, healthy man doing a full day's work. The ileostomy is still perfect, and he wears an ordinary colostomy cap over it. He states that there is no inconvenience at all, except occasionally when he gets a loose bowel. The only time this annoys him is at night, and then only occasionally. Now this patient had blood in his stool for three years. He was treated medically for two years

with no results. Within three months after the ileostomy was performed the blood disappeared from the stools and within five months there was practically no pus to be found. His hemoglobin increased from 30 to 95 and he has made a perfect recovery. The x ray examination showed a slight stricture at the transverse colon. I want to warn you and emphasize that one picture of a colon is not conclusive at all but must be checked up at least three times within a period of two weeks so that there can be no error. I believe that I will let him go another six months and if after x ray examination the narrowing in the colon is not sufficient to warrant operative interference I will then close the ileostomy. If the narrowing in the colon is sufficient to produce obstructive symptoms this can be easily tested by injecting a bismuth heavy paste through the ileocecal valve and seeing what symptoms the patient has such as hyperperistalsis and pain. If the meal passes through very readily the ileostomy can be closed with perfect safety. If there should be considerable pain it is advisable first to make a midline or right rectus incision and increase the opening in the transverse colon either by a lateral anastomosis or a widening of the lumen by a plastic operation. If this is performed successfully the ileostomy can be closed later. It is best closed by resecting  $\frac{1}{2}$  inch of the exposed ileum on each side and then making an end to end anastomosis.

Occasionally a patient has made a perfect recovery as far as his weight and general health are concerned but the disease has been so far advanced that the colon has become quite narrow and remains infiltrated. This infiltration usually extends down to the upper portion of the rectum. If this is the case with the patient in excellent health and having gained in weight rather than leave the ileostomy opening indefinitely it is best to go in and make a complete resection of the colon with a lateral anastomosis between the ileum and the upper rectum or as high up as the bowel seems to be normal. It is fortunate that at least the midportion or upper rectum is quite free of disease even in extreme cases. This anastomosis does away with the presence of an abdominal ileostomy and not infre-

quently the patient has good control of the bowels if the anastomosis can be made at the lower sigmoid or upper rectum

I want to show you the second patient for operation in whom nine months ago we did an appendicostomy. At the time that we did the appendicostomy the entire colon, cecum and appendix were infiltrated. The woman weighed 87 pounds, her hemoglobin was 35, red count 1 600 000 and she was practically moribund. Upon consultation with my medical colleague Dr. Friedman we decided to do a simple appendicostomy. Before operation the patient had two blood transfusions and every day had 1 quart of 5 per cent glucose intravenously. Within two weeks she had gained sufficient strength and her general condition was such that an appendicostomy was done under local anesthesia using a gridiron incision. The appendix was about ten times the normal size with a typical thickening and infiltration of the various muscular coats and also showed some slight ulceration at the point that was amputated later. Within a few days following operation the patient was given a third blood transfusion and then daily for one week was given 1 quart of 5 per cent glucose intravenously. The patient was given daily irrigations by the drop method. She picked up slowly and later on when she had gained we gave her irrigations through the appendicostomy morning and evening of large quantities of normal salt solution. This patient gained about 35 pounds in weight but her hemoglobin is still down to 40, her red count is down to 2 100 000 and she still has blood in her stools. She has made as much progress as is possible with this type of operation and I think this is an excellent example of the difference between the effect of an appendicostomy and an ileostomy and surely demonstrates the inefficiency of an appendicostomy.

We had a similar case about two years ago in which we had exactly the same experience. In this case as we will do this morning we amputated the appendix through the old incision and performed an ileostomy. It simply illustrates that simple irrigation is not sufficient and by far the most important factor

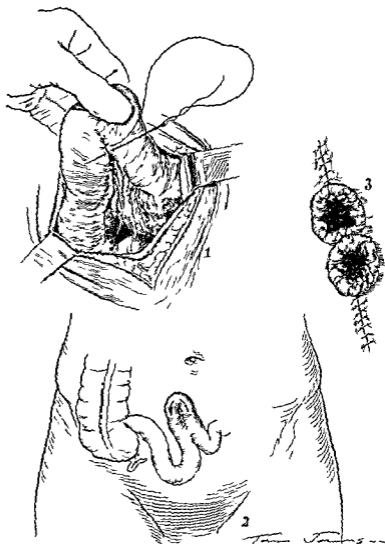


Fig 453—1 Sh w ut r g f th l t ral w ll of th b w l t t me  
 t t t h m t t f r m k k l f th l u m 2 Sh w th knuckl  
 f l m f o m d a b o t 3 t 4 ch f m th l c e a l v a l y 3 Sh w th  
 l t m y p e

to cure ulcerative colitis; to shut off the intestinal contents from going through the diseased bowel. This can only be done by complete ileostomy. To prove that this is true we

have one case as we have stated before that was cured by ileostomy without any irrigation whatsoever. While I believe that the flushing of the pus and sediment and keeping the mucosa of the colon washed clean is a certain aid after all the important thing is to prevent contractions peristalsis irritations and to put the colon at absolute rest. I will now dissect loose the appendix amputate its remaining part invert the stump and then do an ileostomy. I believe this can be easily accomplished through the gridiron incision. I think it is an ideal incision for both an appendicostomy and an ileostomy. This can be easily done under local anesthesia. First we will dissect loose the various layers of the abdominal wall. You can readily see the appendix has elongated the head of the cecum by traction of the appendicostomy and is very readily amputated. I will now expose the head of the cecum and part of the ascending colon and I can say to you that this part of the bowel seems to have undergone a marked healing process. The thickness of the bowel wall is normal now is not infiltrated and has a healthy color as compared with four months ago when it was thick reddened and infiltrated. I may be able to reach over and feel the sigmoid. This is however still hard and infiltrated. It seems in this case that part of the ascending colon and the transverse colon have healed but very evidently the sigmoid is still infiltrated. The appendicostomy seems to have had very little effect on this part of the bowel. As you can very readily see I can now with little trouble pull up the loop of ileum about 6 inches from the ileocecal valve and make a knuckle of it as I did in the previous case. I first suture with catgut the sides of the mesentery near the wall of the bowel so as to make a knuckle then bring it through the gridiron incision just as I did in the former case. One important fact regarding the advantage of the ileostomy is that the patient does not have to diet after the operation. He can eat a mixed diet of anything or any amount he cares to. It is surprising the difference there is in these two operations in regard to the patient's gaining in strength and weight. The second point I want to make is that it is no more difficult to do an ileostomy through a gridiron

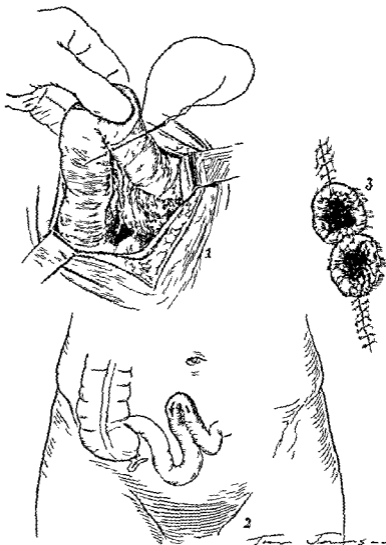


Fig 453—1 Sh w t g fth l t l w ll fth bow l t t m  
 t t h m nt t f m a k u k l fth l u m 2 Shw th kn ckle  
 f l m f med bo t 3 to 4 he f m th l cal v lv 3 Sh w th  
 l t m y pen

to cure ulcerative colitis is to shut off the intestinal contents from going through the diseased bowel. This can only be done by complete ileostomy. To prove that this is true we

## CLINIC OF DR EDWIN W RYERSON

ST LUKE'S HOSPITAL

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### SEPARATED EPIPHYSIS OF LOWER END OF FEMUR TWO OPEN OPERATIONS

Boy of Nine with Separation of Epiphysis of Lower End of Femur, the Result of Being Caught in the Fly wheel of an Engine Open Operation Performed Shortly After Accident to Replace Epiphysis Resulted Unsuccessfully Five Weeks Later Second Operation Performed Result Excellent at Time Case is Presented

THIS boy is nine years of age On December 1 1922 he was caught in the fly wheel of an engine and whirled around striking on the floor His left elbow was broken and the left tibia and fibula also just above the ankle The lower epiphysis of the right femur was torn loose and was displaced about 2 inches upward on the anterior surface of the femur Attempts were made by the family physician to replace the epiphysis but without success A few days after the accident an open operation was done by a local surgeon through an incision on the outer side of the femur about 2 inches above the end of the femur The epiphysis was placed in proper position and a wire gauze splint applied with the knee in 35 degrees of flexion The wound suppurated but the knee joint did not become infected Five weeks after the operation an x ray picture showed that the epiphysis had become displaced and was again about 2 inches above the end of the femur on the anterior surface The boy was then sent to the orthopedic department of St. Luke's Hospital. He was in poor general condition but courageous and optimistic. His left elbow showed a nearly complete ankylosis The fracture in the left lower leg was ununited and a long

plaster of Paris splint was applied at once. The right knee showed marked deformity and about 2 inches of shortening as nearly as could be judged. The knee was very painful and tender but not swollen or edematous. On the outer side of the thigh about 3 inches above the end of the femur was an unhealed incision 4 inches long with pus exuding from its proximal end. The x ray film showed the characteristic appearance of a displaced separated epiphysis. It was considered probable that after five weeks of immobilization on a splint together with a suppurating incision through the muscles of the thigh the epiphysis would be so firmly fixed that an open operation would be required to replace it in the proper position. Accordingly an attempt was made to induce the septic wound to heal by the use of Carrel tubes and Dakin's solution but without success. Six weeks had now elapsed since the original operation and after much deliberation it was decided that no further delay could be allowed. It was recognized that the danger of infecting the knee joint was very great but it was also recognized that if the epiphysis were not placed in its proper position a useless knee would result with a shortening of 5 or 6 inches when the boy had attained full growth. It was not considered that direct longitudinal traction in a Thomas splint or by a Buck extension could possibly reduce the displacement to a satisfactory degree.

On January 15, 1923 the boy was placed on the operating table and anesthetized with ether. The splint was removed and the leg and thigh were scrubbed with benzine and after drying were painted with iodine. The first stage of the operation was an attempt to excise and debride the suppurating wound on the outer side of the femur. The sinus however proved to run so far upward toward the hip and the bleeding was so severe that this plan was soon abandoned and the wound was scrubbed out with iodine on gauze pads and was packed with gauze strips. The entire leg was again painted with iodine and instruments, gowns, gloves and table drapery were changed. A tourniquet was applied and a long incision was made over the front of the knee. The patella was split longitudinally with a hand saw and the quadriceps and patellar tendons were split with a knife.

On retracting the two halves of the incision the articular surface of the condyles was seen facing directly upward toward the ceiling that is anteriorly. The epiphysis had therefore rotated around the end of the femur through an angle of 90 degrees and lay with its metaphyseal surface against the anterior surface of the femur. It was firmly united to the front of the femur and could not be freed even after all of the soft structures at its sides and upper edge had been dissected off. There seemed to be a good deal of callus formation on both of the lateral aspects as if mortar or cement had been plastered in the angle between the two bones. The crucial ligaments could plainly be seen of unusual length running down to the head of the tibia. The space between epiphysis and tibia was much greater than would have seemed possible to the writer but there was no apparent rupture of any of the fibers of the crucials. With chisel and mallet the epiphysis was cut away from the femur, and with great difficulty it was gradually pulled downward into the proper position. This could not be done with the leg in the extended position and was only accomplished by flexing the knee and by the use of a great deal of force. The epiphysis did not seem to fit accurately upon the diaphysis. It was not at all like adjusting a recent fracture where the various serrations can be exactly fitted. It also showed no inclination to remain in any sort of apposition but slipped upward again very easily. Accordingly after placing it in what seemed to be the normal relation with the knee flexed at a right angle a hole was drilled with a  $\frac{1}{8}$ -inch drill directly through each condyle on either side of the middle line rather near the notch and passing directly into the diaphysis. These holes were so placed as to avoid the centers of weight bearing that is the most dependent portion of the articular surface. It was felt that there was no risk of damage to the cartilage since ivory bone or even metal nails and pegs can be set into joint surfaces without interfering with function. Two long ivory pegs  $\frac{1}{8}$  inch or a little less in diameter were then driven up through the epiphysis into the femur. They seemed to hold the bones very firmly together. The soft structures were then carefully sutured and the extensive

wound was closed without drainage. During the dressing of the leg and after the removal of the tourniquet it was noticed that there was a large swelling in the back of the thigh near the

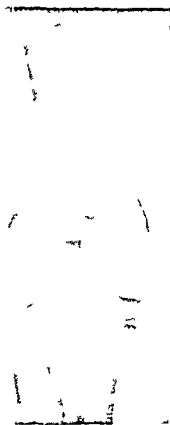


Fig 454—R t g n g a n t k  
d y f t 1 j 3 h w g s p r a t  
of e p p h



F g 455—R o t g n g r a m  
t e p o t o v w t k n f i v e w e k  
f t f i r s t p e r a t o n s h w g e p p h  
y d s p l a i b u t 2 h b o  
t h n d f t h f m u n t h t  
f

gluteal fold. This had not been observed before probably because no thorough inspection had been possible on account of the extreme pain caused by any movements of the limb. An aspirating needle was plunged into the swelling and pus was

found. A small incision evacuated a large amount of pus nearly a pint evidently a gravitation abscess from the infected wound of the original operation. The wounds were dressed

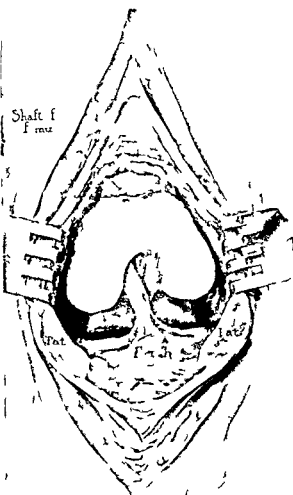


Fig 456—Drawing showing technic of second operation



Fig 457—Roentgenogram taken five weeks after second operation showing formation of periosteal callus

separately and the leg was placed in the double inclined wire gauze splint

Subsequent Course (February 21 1923)—The operative incision has completely healed with only a small stitch infection

at two points over the front of the tibia. The x ray film shows the epiphysis in almost perfect relation to the femur. The wound under the thigh has closed but there is still a little drainage from the original infected wound. The boy still shows an elevated temperature from 100 to 101 F (rectal) in the afternoon but is comfortable and in excellent condition. There is good motion in the joint. It will be a matter of great interest to follow the course of this case because only time can tell how much shortening (or rather lack of growth) will result from the many insults to this epiphysis. It hardly seems probable that the knee joint will become infected after the lapse of the past seventeen days and it is to be hoped that the courage and cheerfulness of this brave little boy will be rewarded by a successful result.

## CLINIC OF DR. GOLDER LEWIS McWHORTER

PRESBYTERIAN HOSPITAL

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### SOME IMPORTANT POINTS IN THE DIAGNOSIS OF GALL BLADDER DISEASE THE TECHNIC OF CHOLECYS TECTOMY

Patient Giving a History of Gall stone Colic Coming on Six  
Months After Pregnancy Findings at Operation Technic of  
Cholecystectomy Diagnosis of Gall bladder Disease

THIS young woman is twenty three years old. She complains of attacks of pain in the right upper quadrant of the abdomen with nausea and vomiting. These attacks come on suddenly with excruciating pain radiating to the region of the right shoulder blade. They last about three to four hours usually requiring a hypodermic which does not completely relieve the pain. The soreness gradually but completely subsides in two or three days. One year ago she gave birth to a normal baby. The onset of these attacks was six months ago six months following childbirth. The attacks come about every two or three weeks but have been a little more frequent of late. They are more frequent after large meals than after small ones. The time of day is usually late afternoon midnight or 3 or 4 A. M. She has never been jaundiced. There have never been any chills or fever. Following the birth of the child she had indefinite pains throughout the abdomen until she wore a supporting corset.

*Past Diseases* —She had diphtheria and measles as a child. Tonsils were removed three years ago for frequent colds and sore throats. She suffers from constipation.

*Family History* —Parents two sisters and two brothers are living and well. History is otherwise negative.

*Examination*—Patient is in good condition. Findings are negative except considerable tenderness over the gall bladder region and muscle rigidity explained by the fact that the last attack of pain was last week. Temperature in the hospital has been normal. White blood count is 7200, hemoglobin 65 per cent, blood pressure 120/75. Urine is negative except for a very slight trace of albumin.

This case is illustrative of a group of cases, but I wish you to note particularly the absence in the history of infection and fever, and that the attacks followed very closely the pregnancy of a very young woman—which fact I shall comment on later.

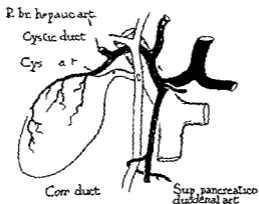


Fig. 438.—The most common relation of the right branch of the hepatic artery, passing posteriorly to the bile ducts. It gives off the cystic artery. The superior pancreaticoduodenal artery is exposed to injury at the junction of the common bile duct in this case.

Injury to the bile-ducts and the occurrence of hemorrhage are too frequent in gall bladder surgery. A third difficulty which must be avoided is injury to the arterial blood supply to the liver. It has been demonstrated that the ligation of the hepatic artery or its branches will produce necrosis of the corresponding lobe of the liver unless there is a rich collateral circulation. Fatal changes usually result from ligation of the hepatic artery in herbivorous animals, but are not so constant in carnivorous ones.

Variations in the relations of the hepatic artery and its

branches are so constant that I will point out the common ones which I noted in a study of the surgical anatomy from the dissections on 37 cadavers. Normally the cystic artery arises from the branch to the right lobe of the liver. The hepatic branch most frequently passes posteriorly to the hepatic bile duct and the cystic arises usually after it has passed to the right side (Fig 458). However the hepatic artery or one of its branches may pass anteriorly to the bile ducts giving off the cystic

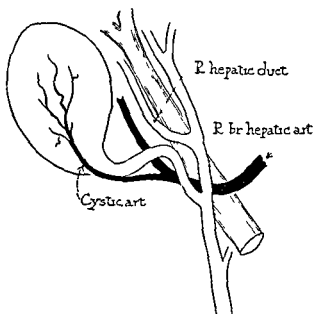


Fig 459 —The right branch of the hepatic artery the cystic duct and the right hepatic bile duct are close together. They form a danger zone in which the blood supply and bile duct of the right lobe might be injured in ligating the cystic duct and artery.

artery usually at the right side of the bile ducts. The cystic artery may arise on the left side where the hepatic branch then usually passes upward to the liver and is not closely associated with the cystic artery in the region where it is ordinarily ligated during the removal of the gall bladder. The cystic artery arose at the left of the bile-ducts in 32 per cent in my series.

Where the cystic artery arises at the right of the bile-ducts there would be a possibility of injuring the arterial supply to the

liver by mistaking the hepatic branch for the cystic or injuring it in ligating the cystic (Fig 459) The cystic artery arose at the right of the bile ducts in 68 per cent of the cases In 20 cases the vessel which gave off the cystic was the only branch to the right lobe of the liver In 2 cases the common hepatic artery to the entire liver passed to the right of the bile ducts in close relation to the cystic duct and might be easily ligated or injured

Frequently the cystic arose from a hepatic artery which came off from the superior mesenteric and in one case from the aorta and passed from below up in close relation with the common hepatic and cystic ducts where it might be easily injured The cystic artery usually passed anteriorly over the region of the neck of the gall bladder where it divides into its peripheral branches intimately associated with the peritoneal covering It is this band of peritoneum to the neck of the gall bladder which is left until the last being partially freed so that the branches of the cystic artery may be ligated as peripherally as possible This avoids the dangers of injury to the bile ducts and lessens the possibilities of hemorrhage from a slipped retracted cystic artery

Usually the gall bladder has about one third of its surface adherent to the liver but in about 5 per cent of the cases it has a distinct mesentery It is important to dissect the cystic duct cleanly down to the common duct because of the danger of traction and of injury to it because of the possibility of overlooking a small stone in the cystic duct or of leaving too long a portion of the duct or neck of the gall bladder which might later become inflamed The cystic duct in my dissections entered the common duct posteriorly seven times and once on the left side

An important anomaly of the hepatic branches of the bile ducts arose in 2 cases where the cystic duct entered the right hepatic branch above its junction with the left branch Under these conditions the right branch might easily be mistaken for or clamped with the cystic duct This would be likely to occur following the method of dissecting the gall bladder from below up

*Operation*—An adequate exposure is best obtained I think by means of a paramedial incision through the right rectus



Fig 460—Method used exposing the gall bladder. A gauze pack is put at the right of the liver. The round ligament of the liver has been cut and is being used for traction. Arrows indicate traction.

muscle fibers and if more room is needed by extending it to the right as in Dr Bevan's incision. I find on exploring the pelvis that conditions are normal the left kidney is negative

to palpation the right kidney negative and the stomach and duodenum are apparently normal. I can palpate several very small stones perhaps a dozen in the lower end of the gall bladder. We will now put a retractor in the lower angle of the incision and explore the appendix. There are several hard masses within the lumen which are probably fecaliths. There is nothing unusual in the technic of dissecting it. We will put

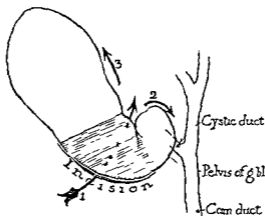


Fig 461—Diagrammatic illustration of the several steps in the removal of the gall bladder. 1 The lower end of the incision of the peritoneum is dissected from the gall bladder posteriorly from the right to the left. The shaded area is the region freed posteriorly in this step. 2 The indicated cut is made downward first freeing the pelvis posteriorly then lifting this up and dissecting down along the cystic duct. 3 This is the last step for the lower end of the gall bladder has been freed the dissection is then continued behind the bladder from below. Clamping of the cystic duct is now being performed. The gall bladder is without exposure dissected on might be decompressed the common bile duct of the right hepatic branch is left unsevered to avoid damage.

a linen purse string suture in crush the appendix near its base and ligate it with a piece of catgut. I will now take a cautery and burn the appendix off between two hemostats. This is the best way I think to avoid any contamination. We will now invaginate the stump inside the purse string. I will take a fine catgut suture and invaginate this region a little more.

We will take the retractor out and put it in the upper right side of the incision and examine the liver and gall bladder.

Upon palpation the gastrohepatic structures are apparently normal and there are no stones palpable in the common duct. The pancreas is negative. I think it advisable to remove the gall bladder. In order to get better exposure I am going to rotate the liver to the left and put in a pack of gauze to maintain the position. Greater mobilization of the liver is obtained by cutting the round ligament which we are using for traction (Fig 460). In beginning the dissection I am holding the gall bladder to the left so that I can make an incision along its right side at its attachment to the liver extending from below over the gall bladder pelvis upward for about 2 inches parallel to the liver attachment (Fig 461).

A line of cleavage is now easily formed between the gall bladder and the liver. I am first using a blunt hemostat but I will now take my finger and dissect under the gall bladder lifting it up and rotating it at the same time. You see that there is practically no bleeding. The bladder is now freed to the left peritoneal fold and I will now peel it away from this fold so that I can get my finger entirely beneath the bladder. The branches of the cystic artery usually pass along this peritoneal fold just below this region and course over the neck of the gall bladder. An opening is now made in this left fold of peritoneum, which permits easier manipulation of the bladder for further dissection. If branches of the cystic artery run in the fold at the opening they are easily ligated.

I now rotate the bladder to the left exposing the right side and with my finger dissect the bladder free farther downward cutting the peritoneum as I go along the right side. Anomalous branches of the cystic artery may run in this region. They are easily seen and picked up with the peritoneal covering. The pelvis which extends below the level of the neck of the bladder is now freed and I am turning it up and holding it with a forceps. This neck of the bladder is followed down along the cystic duct. The posterior attachments of the gall bladder are usually formed of loose connective tissue making separation easy. The anterior and the left peritoneal attachments of the neck and lower end of the bladder are intact. If there are anomalies of the bile

ducts or arteries they will not be endangered by this method of dissection. I have the cystic duct freed well down to the common duct. With the bladder held to the left I am freeing the duct from the anterior and left peritoneal fold.

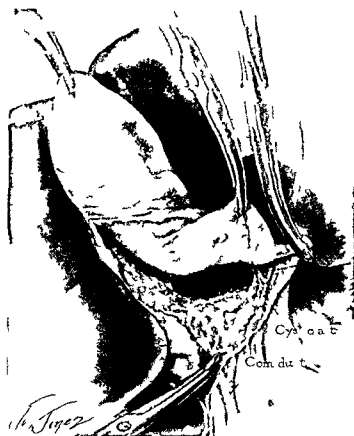


Fig 462—The cystic duct has been cut between two hemostats. Traction upon the upper one will partially enucleate the neck of the gall bladder from the left and anterior peritoneal fold along which the branches of the cystic artery run. This forms quite a men-

The cystic duct is now cut between two hemostats. Traction upon the upper one will partially enucleate the neck of the gall bladder from the left and anterior peritoneal fold along which the branches of the cystic artery run. This forms quite a men-

tery at this point and the several branches of the artery are plainly visible (Fig 462) We will now catch this mesenteric fold with two hemostats and cut it close to the neck of the bladder At this point the cystic artery has divided into several branches which I will ligate with a transfixion ligature so that it will not slip off The field has been dry throughout and we have avoided the danger region of the ducts and cystic artery by ligating the branches quite peripherally The lower part of the gall bladder is now entirely free and we continue the freeing of the upper part as we would in the dissection from below up There will be a little oozing here as you see from the anastomosing vessels to the liver but it quickly stops The stump of the cystic duct is doubly ligated with catgut A few stitches approximate the excess of peritoneum left at the sides of the gall bladder bed

This original method of cholecystectomy (Fig 461) is one that I have worked out while doing difficult dissections in order to avoid several well known dangers

There is less danger of injuring either normal or anomalous bile ducts due to the dissection of the cystic from the gall bladder neck down and ligation of the cystic branches peripherally

There is less danger of hemorrhage from a torn or retracted cystic or hepatic artery since the small branches are ligated peripherally and are quite intimately attached to the peritoneum

In the presence of adhesions and in a difficult exposure I find that it is an easier as well as a safer method than the usual one from below up and it avoids the hemorrhage and other dangers in the method from the fundus down

I am going to leave a cigarette drain near but not against the stump of the cystic duct Occasionally the cystic duct opens up due usually to postoperative vomiting with increased bile pressure and bile drains for from two to four days when it promptly stops without harmful effects In closing the abdomen I am going to use several buttons through which the silk worm gut is tied for tension sutures well back on each side of the wound I think that this method which Dr Bevan has described is a very valuable aid in taking tension off of the wound margin

within eight days of delivery. One of these a patient thirty one years old that I operated on last week developed her first gall stone colic on the eighth day after delivery from her first baby when she first got up. She had experienced *indefinite stomach disturbances* during the pregnancy so she stated but they were not characteristic of gall stones. I believe that the change in intra abdominal pressure must have been a factor in the production of the attack. It is also probable that the increase in abdominal pressure was a factor in the development of the tones.

Changes in general body metabolism also occur during pregnancy and lactation. These factors may be aided by the local disturbances of circulation in the gall bladder or of stasis due to a shifting or kinking of the ducts or blood vessels as a result of any marked change in intra abdominal pressure.

I believe that while we may have stone formation resulting later from mechanical factors we may have those same factors producing symptoms from gall bladder stasis without gall stones. The actual part infection plays in stone formation with bile stasis is difficult to say since with infection there may be secondary stasis due to inflammatory swelling. It is especially important to use all care in making a definite diagnosis in order to avoid operating on patients with conditions simulating gall bladder disease. But in operating it is important not to leave a fairly normal appearing gall bladder which is the seat of *infection or stasis*.

It is unnecessary to go into the complete differential diagnosis of gall bladder disease but I am going to mention two conditions not given their proper consideration. A common one is that due to inflammation or dilation of the kidney pelvis. The second is in salpingitis in which upper abdominal symptoms may be prominent.

Since it is common to find a few leukocytes in a passed specimen in the normal female and since in the male there is not infrequently a history of an old urethritis one may easily overlook a pyelitis in which there are a small number of pus cells or an intermittent discharge of pus in the urine. If in doubt

where there are a few pus cells and the symptoms indefinite I examine a sterile catheterized specimen of urine. If there is still any doubt about the kidney condition a cystoscopic examination and perhaps a pyelogram are made.

During the past month I have had 2 women patients come into the hospital with the diagnosis of gall bladder disease. In one patient only a few leukocytes were found in both a passed and a catheterized specimen of urine. Here there was a moderate hydronephrosis shown by the pyelogram and a *Staphylococcus albus* infection in the right kidney pelvis. In the other patient there was a low grade infection in the right kidney due to a Gram positive coccus resembling a streptococcus. The left kidney in the first case had practically normal urine with only a few pus cells as compared to the right side while in the second the urine was normal.

These 2 cases could have been diagnosed gall bladder disease without these tests and operated unnecessarily subject to all of the possible complications of such an operation. In addition to that they came in with definite diseased conditions which were relieved only by appropriate treatment.

I pointed out the occurrence of upper abdominal symptoms with the temporary diagnosis of cholecystitis in a case of pyosalpinx in the October 1920 number of the *Surgical Clinics of Chicago*. I have repeatedly observed this pain, tenderness and muscle rigidity in the abdominal region just lateral to the upper lumbar vertebrae and over the kidney pelvis about which the lateral lumbar lymph nodes are situated in a moderately large number of cases of salpingitis.

The pain in the upper abdomen is on the side where pain and other evidence of salpingitis occur in the pelvis. In these cases there has been no evidence of a pyelitis and the symptoms subside parallel with the progress of pelvic inflammation. Similar symptoms develop on the other side with the onset of inflammation in the other tube. These symptoms in a few cases precede the pelvic symptoms a day or two; in others they follow the pelvic symptoms. Since upper abdominal symptoms may be the predominating ones in certain cases with pelvic inflam-

mation mistakes may be made where a good history is not obtained or a pelvic examination refused or unsatisfactory

There may be several explanations offered for this upper abdominal symptom of pain with more or less localized tenderness and muscle rigidity with infection in the fallopian tubes and perhaps also in the ovaries. It may be the result of an ascending lymphangitis and adenitis of the lateral lumbar lymph glands similar to a cervical adenitis following a throat infection. It may be a referred pain along a spinal nerve segment zone of the cord similar to the pain over the scapula in gall stone colic. It may be due to the inflammation extending along the lymphatics to the kidney the pelvis or ureter with a certain amount of inflammation about them. It may be due to an extension of this inflammation to the regional lymphatics of the liver pancreas or gall bladder or to these viscera.

The objection to the two latter theories is that the upper abdominal symptom parallels the evidence of pelvic inflammation although it may precede the latter a day or two. In case the salpingitis is unilateral the upper abdominal symptoms are unilateral and with the development of inflammation of the other tube similar upper abdominal symptoms develop on the other side. The presence of confusing abdominal symptoms in this condition as well as in many others involving extra and intra abdominal viscera again emphasizes the importance of a thorough study of each individual case rather than a hurried laparotomy.

## CLINIC OF DR ROBERT H HERBST

PRESBYTERIAN HOSPITAL

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### URETERAL CALCULUS

A Case of Calculus in the Upper Portion of the Left Ureter  
Treated by Injections of Sweet Oil Delivered into Bladder  
by Incision and Dilatation of the Ureteral Meatus

THE first case which I wish to present to you this morning entered the Presbyterian Hospital complaining of a single symptom viz recurrent attacks of severe lumbar pain radiating to the suprapubic region

At times it is difficult to determine the cause of pain in this region and to differentiate between intra abdominal and retro peritoneal pathology The most common retroperitoneal condition producing pain of this character is ureteral calculus The cause of the pain in these cases is twofold first the obstruction to the urinary flow producing distention of the renal pelvis and second the descent of the stone along the ureter with resulting trauma of the ureteral wall The urinary obstruction plays the larger part in the pain production because the same type of pain only less severe is seen in other conditions of ureteral obstruction such as stricture blood clots kinking of the ureter pressure of adjacent organs etc When a stone becomes lodged in a certain location the urinary flow from the kidney is either partially or completely blocked this is followed by a sudden distention of the kidney pelvis and an increase in the intrarenal pressure

Most ureteral stones are developed in the kidney but do not produce pain until they are arrested in their descent to the bladder Although a stone may pass from the kidney to the

bladder without the knowledge of the patient most of them are arrested and produce pain in the course of the descent.

The change in the location of pain as the calculus moves toward the bladder is often characteristic beginning in the lumbar region extending along the course of the ureter to the end of the penis testicle and thigh of the affected side. Indeed one may sometimes locate the position of a stone by analysis of the areas of pain and tenderness. Behan in his excellent monograph on pain calls attention to the pain areas produced by renal and ureteral calculi and shows graphically the nerve regions traversed by a stone in its excursion from the kidney to the bladder. By a thorough study of the skin disturbance of the spinal nerves of this region the location of a stone may be determined. In addition we have the zones of hyperalgesia of Head which by careful observation may assist in the diagnosis.

Tenderness on deep palpation is often an aid in the diagnosis and location of a stone in the ureter this may be found even in the latent periods.

Again the skin of the scrotum on the affected side may be extremely sensitive to touch both during and between attacks of ureteral colic. The testicle may be drawn up toward the external ring.

The patient we have before us states that his attacks of pain are limited to the lumbar and suprapubic regions.

**History**—His family history is negative except that one brother died of tuberculosis.

His past history is entirely uneventful and even in regard to venereal diseases is negative.

**Present Illness**—The history of his present complaint is not typical but nevertheless suggestive. The first attack of pain began two weeks ago in the evening after the patient had eaten grapes. Shortly after the pain began an attempt was made to take a dose of magnesium sulphate but he was unable to retain it and vomited at once. The pain persisted all that night but was not severe enough to keep him from sleeping.

Since the first attack the patient has experienced four others the last one two days ago. At present he is free from pain.

He enters the hospital for examination and skiagrams

**Physical Examination** —The patient is a well nourished man forty three years of age not acutely ill

**Head** —The examination of the cranium is negative The eyes react to light and accommodation The nasal passages are patent The teeth are not well cared for

**Neck** —There is no cervical adenopathy and the thyroid is not enlarged

**Chest** —There is good expansion The lung borders excursion and resonance are normal No rales are present The heart shows no murmurs and the borders are normally located Its rate is normal and regular The first sound is dull and the second snappy The pulmonic second sound is not accentuated

**Abdomen** —The liver and spleen are not palpable The kidneys are both palpable The palpable colon is not tender There is tenderness in the left kidney region to deep palpation This is present also along the course of the ureter on this side No hernias are demonstrable

**Extremities** —The patellar reflexes are present and equal Plantar reflex is present and sluggish The abdominal and cremasteric reflexes are present and equal

**Laboratory Findings** —Blood pressure Systolic 118 diastolic 70 pulse pressure 48

Leukocytes per c mm 11 700 hemoglobin 80

Urine Spontaneous sample cloudy amber color acid nucleio- and serum albumin negative Sugar trace on cooling Micro —few epithelial cells erythrocytes 1 plus leukocytes 1 plus amorphous urates

On admission Temperature 98.8 F pulse 80 respirations 20

Slight temperature in evening never however rising above 99.2° F

Pulse range 56 to 88

Respiration range 16 to 20

**Cystoscopy** —This examination revealed the entire bladder wall slightly injected cystitis 1 plus Bladder otherwise negative The left ureter was difficult to catheterize due to small

ureteral orifice. Finally we succeeded in passing a No. 4 shadowgraph catheter which was stopped at a point 11 cm. from the ureteral orifice.

*x Ray Film*—Kidney shadows are unusually large but may be normal for this patient. The right kidney extends to the upper border of the fourth lumbar vertebra, the left kidney to the transverse process of the third lumbar vertebra. On the left side the shadowgraph catheter extends to the lower border



Fig. 463—Catheter tip at lower border of fourth lumbar vertebra

of the sacro iliac joint. Immediately above the catheter tip is a small round dense shadow, probably a ureteral calculus obstructing the further passage of the catheter. No other evidences of calculus are to be seen. No evidences of bone changes are noticed.

*x Ray Film Five Days Later*—The small round dense shadow previously seen at the lower end of the sacro iliac joint is now plainly to be observed just below the level of the ischial spine. The other findings are the same as previously noted.

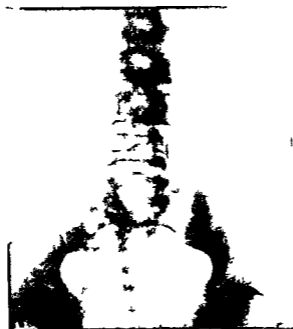


Fig. 464 — Calculus opposite upper border of the fifth lumbar vertebra



Fig. 465 — Calculus at the crest of the ileum

From these findings it is evident that this patient is suffering from a ureteral stone

Following the first cystoscopic examination and the first x ray two injections of sweet oil (5 c c each) were made into the left ureter and judging from the location of the shadow in a film taken five days ago we have succeeded in moving the calculus to the lower extremity of the ureter (Fig 466) However in a film taken today the stone is seen in the same position as it was five days ago it is probably impacted in the mural portion of the ureter The small ureteral orifice found on previous cystoscopic examination is probably preventing the stone



Fig 466—Calculus impacted in the lower end of the ureter

from passing into the bladder The paroxysmal pain have been very severe for the last few days so I shall attempt to assist the passage of this stone by cutting the lower end of the ureter

Operation—The urethra has been anesthetized by the instillation of 2 drams of 1 per cent solution of cocaine and the bladder irrigated with warm sterile water I will now pass the operating cystoscope into the bladder The left ureteral orifice although small is gapping open and the bladder wall 1 cm

above it is bulging. It is evident that the orifice is too small to allow the passage of this stone. I will now pass these scissors through the cystoscope into the upper angle of the left ureteral orifice and make a cut about 1 cm. in length (Fig. 467). I can now see the calculus engaged in the enlarged opening and by pressing on the bladder wall above it with the end of the scissors I have succeeded in forcing the stone into the bladder.

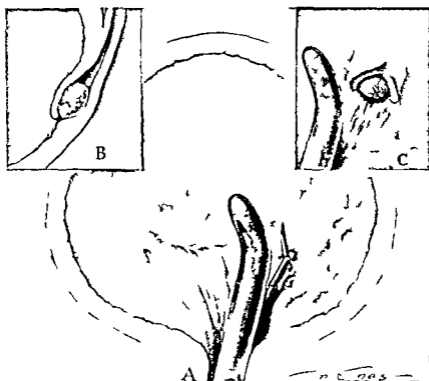


Fig. 467 —B Calculus caught behind ureteral orifice. A Cutting lower end of ureter with cystoscopic scissors. C Calculus presenting through cut ureteral orifice.

I will remove the cystoscope and inject 2 ounces of sweet oil into the bladder to assist the patient in passing the stone from the bladder.

**Note**—Two hours later the patient passed the stone in voiding without much discomfort. It is rarely necessary to crush a ureteral stone after it has reached the bladder. Most of them will pass through the urethra with the assistance of oil left in the bladder.

With our present day methods of diagnosis few ureteral stones escape detection. Many are found by the x ray and localized with the shadowgraph catheter. Those which fail to produce a shadow on the film may be found with the wax tip catheter or the shadow intensified by the injection of a contrast fluid into the ureter before taking the film.

**Treatment**—Over 50 per cent. of renal stones which engage in the ureter will pass spontaneously and a large proportion of those which become arrested can be assisted by cystoscopic manipulations. Dilatation and lubrication of the ureter will aid the passage of many of these stones into the bladder. In those cases in which these methods fail and the stone is impacted in the lower extremity of the ureter its delivery can be easily accomplished by cutting the meatus through the operating cystoscope. This incision may be carried up for a distance of 1 cm. with safety. In most cases the cutting of the meatus is all that is necessary. The incision usually heals in a few days without contraction and stricture; however if this occurs dilatation with ureteral bougies should be practised.

## PAPILLOMA OF PROSTATIC URETHRA TREATED WITH RADIUM AND FULGURATION

THE patient who is sixty two years old enters the hospital complaining of painful emissions and bloody semen

**Past History** —He has had the usual diseases of childhood Otherwise he has been free from disease He denies venereal diseases

**History of Present Complaint** —Seven or eight years ago he experienced pain at the time of seminal ejaculation This pain was more severe when the ejaculations were several weeks apart than when they were more frequent The pain became so marked that intercourse was discontinued

Spontaneous emissions were likewise painful

Last March about five months ago he noticed blood in the seminal fluid on two or three different occasions For this he consulted a physician

He has never had any urinary symptoms and states that the urine has never been stained with blood but red blood cells have been found a number of times on examination

**Family History** —Father and mother died by drowning One brother died at fifty five years of age from an accident Two sisters died in infancy There is no history of tuberculosis in the family

**Physical Examination** —The patient is a well nourished man of sixty two years of age of about 150 pounds weight and 6 feet in height

**Head** —The ears nose and throat are negative The mouth is negative except that several teeth are missing

**Neck** is negative

**Chest** —The chest lungs and heart are negative

**Abdomen** —The abdomen liver spleen and kidneys are negative

**Extremities** negative

**Genitalia externa** negative

*Lymphatics* negative

*Reflexes* all normal

Temperature varies from 97.6 to 99 F

Respiration varies from 18 to 20

Pulse varies from 82 to 88

Blood pressure (Gycos) Systolic 134 diastolic 88

On second admission

Blood—Leukocytes 8900 hemoglobin 85 No plasmodium malariae

Urine Clear acid no sugar or albumin

No casts bile indican or crystals a few red blood cells were found

Leukocytes 68 per cubic millimeter

Catheterized bladder specimen 68 cells per cubic millimeter

Culture—no gas no T B in direct smears

Cystoscopic examination reveals a normal bladder

On rectal examination the prostate gland and seminal vesicles were found to be normal and x ray of the prostatic region did not show any calculi

The symptoms of which this patient complains would cause one to think of an inflammatory process involving the seminal vesicles the prostate gland or both. Particularly would one think of tuberculosis or a neoplasm developing in one of these organs or of a neoplasm of the prostatic urethra. Stone of the seminal vesicle or prostate may also produce bloody semen and painful ejaculations.

The more common symptoms of growths of the posterior urethra are frequency imperative urination difficult urination to the point of complete obstruction when the growth is large. To these may be added the symptoms of which our patient complains viz painful ejaculation with blood stained semen.

By means of the water dilating straight urethroscope three papillomata were found. These appeared to be rather typical papillomata differing in structure from the more common polyps found in this region which are usually small pedunculated growths resulting from long standing infection. However these appear

to be true papillomata resembling the common growth found in the bladder but rarely seen in the urethra Two were found attached to the left side of the internal urethral orifice the other on the floor of the prostatic urethra 1 cm in front of the internal urethral orifice

Radium (25 mg) in a tube attached to a staff screened with 14 mm of gold and a rubber capsule was inserted into the prostatic urethra This was left in place for seven and one half hours—a dosage of 187.5 mg hours

The patient left the hospital the next day

Urethroscopic examination On readmission to hospital (11/24/21) three months and fourteen days after the first treatment the growths were found unchanged

Radium (25 mg) was again inserted into the posterior urethra, and left in place for eight hours—a dosage of 200 mg hours The patient left the hospital four days later

Urethroscopic examination on readmission to hospital the third time on April 20 1922 about five months after the last treatment By means of a cysto urethroscope two small papillomata were seen hanging from the left border of the internal urethral orifice also a large growth was found on the floor of the prostatic urethra

From these findings it is evident that the radium exposures did not have much influence on these growths

Owing to the age of the patient and the papillary type of the tumors one would have to consider the possibility of malignancy and with this in mind we made the two applications of radium

Today we are going to try to destroy these tumors with the high frequency current applied through the cysto urethroscope

For diagnostic purposes the straight water dilating urethroscope is most useful because it gives the operator the opportunity to observe the entire circumference of the urethra in one field while the cysto urethroscope gives only a limited field However it is difficult to direct the fulgurating electrode to the tumor through a straight tube but by using the directing arm of a cysto-urethroscope one is able to apply and control the point of the electrode more accurately

I will now introduce the beaked cysto-urethroscope into the bladder turn on the water and by gradually withdrawing the instrument I can now see the two growths which are situated on the internal urethral orifice. I will apply the electrode to them and turn on the current (Fig 468). The tumors are promptly blanched wherever the electrode touches them and by moving the electrode from time to time I have succeeded in destroying these growths. We will now draw the instrument outward and turn it slightly downward which brings the tumor situated on the floor of the urethra into view. We will again turn on the

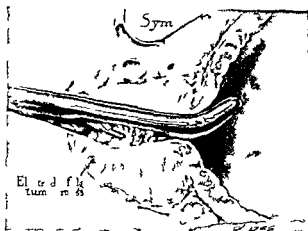


Fig 468—Destruction of papilloma of the posterior urethra with fulguration.

current and destroy this growth. I will now remove the instrument and you note that there is practically no bleeding. The entire operation has been painless owing to the instillation of 3 c c of 1 per cent solution of cocaine into the posterior urethra just previous to the introduction of the instrument.

This patient will be observed from time to time. If the growths have not been entirely destroyed or new ones develop the operation will be repeated.

**Discussion**—Polyps are often seen in the urethra while papillomata are rare in this location. The latter may be benign or malignant. Urethral growths are usually small but may at

tain a size which produce obstructive symptoms. They are usually the result of prolonged irritation to the mucosa by long standing chronic infectious processes. As a rule they appear in the posterior urethra about the verumontanum and in the region of the internal sphincter of the bladder. Those near the verumontanum are associated commonly with sexual and neurasthenic symptoms and blood stained semen while those at the bladder neck are connected with urinary disturbances such as frequency dysuria and hematuria. The benign growths may be removed with a snare but are more effectively destroyed by fulguration and where malignancy is suspected the treatment should be supplemented with radium.



## CARCINOMA OF THE BLADDER. TREATED BY RADIUM NEEDLES INSERTED INTO THE TUMOR MASS THROUGH THE VAGINAL WALL

**Present Complaint.**—The patient entered the hospital complaining of intermittent attacks of hematuria frequent and difficult micturition dysuria and a feeling of pressure in the lower abdomen.

**Family History.**—Father died of "some abdominal trouble" at eighty years of age. Mother died of carcinoma of the uterus at fifty-two years of age. One brother killed at eleven years of age and another killed in the recent war and yet another died in infancy. Husband died at eighty years of age of pneumonia. Four children are living and well and 3 died, one of pneumonia, 1 of flu and pneumonia and 1 of some fever.

**Previous History.**—She has had the usual diseases of childhood. Pneumonia one year and three months ago gall-stone attacks three years ago. No surgical procedures. The menopause occurred at forty-five years and no uterine bleeding since.

**Onset and Course.**—A feeling of pressure in the lower abdomen began four months ago. This pressure was relieved at first by micturition and lying down but during the last ten days has become a constant bearing-down feeling unrelieved by anything more severe than formerly and growing worse. She describes it as "something pressing on the mouth of the bladder."

Hematuria began about three months ago and appeared at intervals of three or four weeks during the first two and a half months. Since November 29, 1922 the bleeding has been constant appearing with nearly every micturition. The bleeding occurs at the start and during the course of the voiding. Clots have appeared during the past ten days becoming gradually larger and more numerous.

Frequency of micturition has been present for many years.

averaging six to seven times diurnally and three to four times nocturnally. Since the onset of her present trouble about four months ago the frequency has gradually become worse until now she micturates at times every ten to fifteen minutes nocturnally and almost as frequently during the day.

Difficulty in urination began three months ago. This consists in difficulty in starting the act and it is steadily becoming worse. When a clot of blood passes the urinary stream is interrupted and considerable pain is felt until the clot is delivered.

Burning pain during voiding has been present for years and is not any worse now than formerly.

**Examination**—A fairly well nourished anemic woman seventy three years of age. A widow. During the past six months she has lost 15 pounds in weight.

**Head**—Head and neck negative. Eyes ears and nose negative.

**Chest**—No cough lungs negative. Some dyspnea on exertion and some swelling of the feet when she is up and about. There are occasional attacks of palpitation and dizziness.

*Nervous system* is negative.

The *osseous system* is negative.

*Gastro intestinal system* is negative.

**Mouth**—Several teeth in lower tier with amalgam fillings and several missing. No pyorrhea. Plate above. Tongue and pharynx negative.

**Heart**—Not enlarged. Soft systolic murmur heard at apex and not transmitted. No arrhythmia.

**Abdomen**—Walls thick and flabby with stræ abdominalis present over lower half. No rigidity no masses palpable. Slight tenderness over umbilical and hypogastric regions. Pressure in hypogastrium to left of midline creates the sensation of desire to urinate. There is some tenderness on deep palpation over the right flank.

Spine negative.

Extremities negative except for slight edema of both ankles.

Reflexes present.

Skin negative.

Rectal examination (bimanual) A hard firm mass palpable through anterior abdominal wall

Vaginal examination A hard smooth rounded elongated mass is felt projecting into the vagina anteriorly on the right side It can be felt through the abdominal wall to a height of three fingers above the symphysis It is but slightly mobile

Cystoscopy reveals a large tumor involving the right side of the bladder extending from the vertex to within 1 cm of the internal urethral orifice On the surface of the tumor there are areas of necrosis some of which are covered with incrustations *This tumor is undoubtedly malignant*

By vaginal palpation during cystoscopy a mass is felt corresponding to the area involved in the bladder and protruding well into the vagina It is about as large as a small hen's egg The vaginal mucosa is intact

*Laboratory Findings*—Blood December 5 1922 Leukocytes per cubic millimeters 15 000 hemoglobin 65 Blood pressure systolic 202 diastolic 102 pulse pressure 100

Urine (December 5 1922) Spontaneous specimen cloudy pink color alkaline serum albumin 2 plus No sugar no casts few epithelial cells and leukocytes Blood test 2 plus (benzidin)

Feces spontaneous Watery gruelly no blood pus 1 plus mucus 1 plus

Temperature range 98.4 to 99.6 F

Pulse range 76 to 96

Respiration range 18 to 20

This rather large tumor found in the bladder of our patient has apparently remained within the limits of the bladder wall It can be readily palpated both through the rectum and vagina On cystoscopic examination it appears to involve about one half of the right posterior lateral wall of the bladder It is papillary in type and shows several areas of necrosis The bladder wall surrounding the tumor is edematous These findings are significant of malignancy and we evidently have to deal with a papillary carcinoma of the bladder

Bladder tumors rarely invade the surrounding structures and remain confined to the cavity of the bladder for a long

period of time. Metastases as a rule appear late and develop in the abdominal viscera spreading by way of the pelvic lymphatics. Cases of metastases from bladder tumors have occurred in remote organs but such metastases are comparatively rare and occur late.

There is one dominating symptom which should always be investigated by cystoscopic examination without delay viz hematuria especially of the intermittent painless type. This

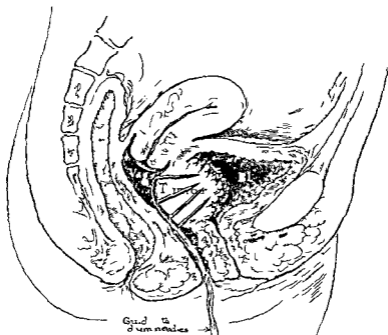


Fig 469—Shows diagram of inserted to tumor mass through ant vaginal II

patient noticed blood in her urine over three months ago but she did not seek help until pain and frequency of urination became unbearable.

**Treatment**—After a careful general physical examination we have not been able to determine any metastasis. The tenderness found in the right flank is probably due to a moderate degree of hydronephrosis produced by pressure on the lower end of the right ureter by the tumor. On cystoscopic examina-

tion the right ureter did not appear to be involved but the growth extended well up to the ureteral orifice evidently producing some obstruction to the flow of urine from the right kidney

Excision short of complete cystectomy cannot be carried out in this case because the tumor extends well up to the internal urethral orifice. However its location makes it easily accessible to irradiation through the anterior vaginal wall, in fact the entire mass can be outlined through the vagina. Radium needles can be introduced directly into the base of the tumor through the anterior vaginal wall giving an excellent opportunity for destruction of the tumor.

Operation—I will infiltrate the anterior vaginal wall with  $\frac{1}{2}$  per cent novocain solution. By using a deep vaginal retractor we are able to introduce the radium needles through the anterior vaginal wall directly into the base of the tumor without any difficulty. We are placing these needles about 1 cm apart and you will note that it has required four needles to cover the area (Fig 469). These needles all contain  $12\frac{1}{2}$  milligrams of radium and are screened with 3 mm of steel. They will be removed in twelve hours giving a dosage of 600 milligram hours. The time for repeating this treatment will depend upon the amount of local and general reaction following this exposure.

I will now introduce a cystoscope to determine the position of the needles in relation to the tumor. The points of the needles cannot be seen protruding into the lumen of the bladder and evidently are well embedded in the tumor mass.

Postoperative Note—The patient did not experience any local or general reaction and the vaginal mucosa was not disturbed by the radium. Ten days later the treatment was repeated.

One month after the first exposure. The tumor is greatly reduced in size. hematuria has almost entirely ceased and micturition is easier.



## CLINIC OF DR KELLOGG SPEED

PRESBYTERIAN HOSPITAL

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### COMPRESSION FRACTURE OF THE DORSOLUMBAR VERTEBRÆ PATHOLOGY AND TREATMENT

Pathology of Compression Fracture of the Dorsolumbar  
Vertebræ History and Autopsy Report of Two Cases Treatment

COMPRESSION fracture of the dorsolumbar vertebra involves primarily the corpus of the vertebra. All concomitant pathology involving the other portions of the bony spine, the ligaments and the spinal cord is secondary to the changes in the bodies of the vertebræ involved or can be classed as secondary in point of time at least. They may, however, assume primary importance for, as in skull fracture, the bone lesion is relatively insignificant from a prognostic standpoint, the amount of damage to the central nervous system remains paramount. The exception in the spine is its change of weight bearing power and flexibility. The amount of injury to the cord or its nerve prolongations has the greatest influence on the patient's future. Yet the structural injury of the bony spine with its ligamentous and muscular attachment must first attract our attention in a basic study of this injury.

Although roentgenographic study of bone architecture as applied to the diseases of bone or fractures has yielded progressive information and broadened both our ability to diagnose lesions of bone and our understanding of bone pathology, it seems that in fracture reports we are coming to lean too much on the rayed findings. There is still something to be gained from gross pathologic or microscopic examination of broken bones, a correlation between unrecognized and faint roentgeno-

graphic findings must be made with real structural and pathologic conditions so that our interpretation of roentgenograms becomes reliable

Compression fractures of the spine are being recognized as of frequent occurrence. Probably the old preponderating ratio of fractures of the spinous processes compared to other parts of the vertebræ will soon be upset when new fracture statistics are compiled. Such new statistics will be based on exacting examination of all back injuries coupled with interpretations of x ray findings now so distinct unlike those of a few years ago.

The bodies of the vertebræ locked together by their laminae and transverse processes, steadied by the ribs and spinous processes and their attached muscles and ligaments and finally tied together by the interspinal ligaments bear the burden of body weight. With the aid of interspinous cartilaginous disks they take up most of the rude shocks. The curves of the spine cervical, dorsal and lumbar aid in this process. All compression fractures are caused by an exaggeration of the normal curve of the spine and must be the result of hyperflexion. This flexion may be the result of a fall from a height, a sudden superbending of the back as in driving under a low door or the same position forced by sudden trauma. Because the vertebral bodies sustain the body weight they must be compressed by this flexion. If the action of hyperflexion is slow and yet ponderous without axial deviation of that portion of the spine above the site of maximal flexion then the body or bodies affected are compressed. The vertical diameter of the corpus is lessened without displacement of bone in any direction and the cancellous bone of the corpus simply becomes denser. If however the hyperflexion is accompanied by axial deviation of the spine above the dorsolumbar region as from a twist or side shove then one side of the vertebral body may be compressed more than the other resulting in an increased narrowing of the compressed side while the opposite may remain in normal shape. Rarely two lumbar vertebræ are simultaneously compressed and there may be one or more normal vertebræ between the two injured

Should there be also a sudden jarring application of the force the vertebra lying at the apex of the rapidly formed hyperbend of the spine may be sheared off through the cancellous body. Consequently the portion of the body thus sheared off is displaced and always in the direction taken by the causative force. The upper or mobile portion of the spine moves with it to change axial relation to the lower and fixed portion. A law may be expressed that in compression fractures of the vertebral bodies with displacement the upper fragment moves forward and sometimes lateralward as well and the upper segment of the spine is always displaced forward with it. We have then displacement and its consequences are far reaching but are after all secondary to this mechanism. As the upper portion of the spine moves forward and flexes there must be a partial unlocking of the intimate articulating relations of the vertebra just above the fracture and the one involved in the fracture. This leads to luxation and possibly to fracture of the laminae or rarely the transverse processes and as the displacement occurs some ligaments must be rent asunder. In this moving forward and bending or tilting the spinous process of the vertebra just above the fracture tends to change its angle becoming more prominent beneath the skin of the back to form a gibbus. Also as the upper vertebra moves forward retaining its normal axial bony and ligamentous relation with all other vertebræ above it its arches and laminae approach near to the corpus of the injured vertebra below and thus narrow the spinal canal encroaching on the space supplied for the cord. This displacement may be so great that the cord is pinched completely in two.

When the pressure of bone affects the cord pressure necrosis and hemorrhage within it follow. Concussion of the cord simulating complete severance is seen. If the hemorrhage is extradural it is of little moment and promises to be absorbed. Hematomas is not necessarily fatal nor does it frequently cause permanent symptoms. Hemorrhage beneath the dura and in the substance of the cord is of greater import. It is called hematomyelia and may spread up and down the cord for several inches. The pressure of this hemorrhage may lead to the death

of axis cylinders or of the cells in the anterior horn. Occasionally it is central in character and when cysts form later from the extravasated blood a condition resembling syringomyelia results with loss of pain and temperature sense in the region involved.

When nerve cells and axis cylinders are destroyed their regeneration within the cord probably never occurs. If the axis cylinder or cells are compressed by hemorrhage or exudate relief of that pressure not too long delayed may restore the nerve fibers to function.

I firmly believe that all the bone displacements in compression fracture as of the vertebral body and its component parts take place at the time of injury. Whether the cord is damaged by pressure or hemorrhage or goes free matters little to bony repair. When no cord symptoms follow the injury and the patient in a short period becomes ambulatory or tries to work there is no great increase in the bone deformity and displacement because a process of repair and of callus formation starts immediately as in any fracture. The cancellous tissue of the vertebral corpus lends itself to early and sufficient callus formation to bolster up the defect caused by the injury. Its blood supply is rich and is never totally destroyed even when the bone is strongly compressed. Nevertheless it is clinically observed that when a patient is thus injured and presents no immediately noticeable gibbus after several weeks or months of weight bearing the spine tends to give more and more. A well defined gibbus results cord pressure appears and it has been thought that the bone of the corpus gradually absorbed to weaken and permit the further bending of the back. In 1895 Kuemmel in his description of 5 cases of osteitis of the spine while acknowledging that trauma was a factor felt that he had discovered an undescribed condition. That was in pre-roentgenologic days and yet today there are practically no instances of these back injuries recorded where successive Roentgen exposures of the spine have been made which might demonstrate a gradual absorption and shrinking of the corpus. Those patients which come to us are already well advanced in their gibbus formation.

or if received soon after injury are given treatment which precludes weight bearing with secondary deformity.

I consider that the increase in angularity of the spine is largely contributed to by the giving of the various ligaments which were traumatized at the time of injury. The condition is much different from tuberculous spondylitis when the vertebral body disintegrates softens and changes shape from pressure but does so with intact ligaments. Following trauma which results in compression fracture the ligaments if torn must give when the patient continues weight bearing.

During these secondary changes exostoses often develop from the vertebral body. A sudden secondary jar some time after the original injury may complete the forward dislocation of the upper spinal segment and suddenly sever or press upon the cord with paralytic results. These complications are seen after osteopathic and chiropractic adjustments. The final stage is one in which the compressed and shattered vertebral body resuming its weight bearing function with renewed blood supply callus formation strengthening of ligaments and changes in articular facets comes to a resting stage where no further angulation results. This may be without gibbus formation if the body has been uniformly compressed and given a chance to heal. Usually it ends with a gibbus and after a long period—two to five years—pain disappears.

Secondary pathology with its manifesting symptoms appears immediately after bone and cord injury. If the cord has been severed there follows complete motor and sensory paralysis of all parts whose supply lies at the level of or below the fracture. Primary cord shock, edema or even hemorrhage may simulate complete severance but these conditions tend to improve as normal circulation is re-established or pressure is removed. The muscles begin to atrophy in their flaccid condition blood vessels dilate skin sweats and the slightest trauma or prolonged pressure as of lying in one position produces painless areas of pressure necrosis. These areas lack vitality infection progresses rapidly in them and even the most meticulous care may fail to cure them.

More important than these muscle changes are the paralyses of bladder and rectum. The rectal sphincter in a lesion of complete destruction of its nerve supply becomes relaxed the anal mucosa pouts out as in a prolapse and feces dribble away without the patient's knowledge or pain a veritable incontinence. If the rectal center in the cord is without the area of damage the local reflex arc of the anal sphincter may be intact and freed from impulses arriving from above the condition may result in a spasm of the anal sphincter with retention of feces.

While the anal disturbance is trying and calls for constant nursing attention it has relatively less importance than bladder disturbance. When the bladder center is concerned directly or even by proximity to the cord lesion its sphincter tends to become spastic and as control is lost the bladder cannot empty itself by opening its outlet. The patient retains his urine frequently without pain and is unconscious of this accumulation. The bladder enlarges becomes an abdominal organ and shows as a tumor mass above the pubes. Even that does not worry the patient much but unfortunately it does worry his friends and particularly his medical adviser. If the bladder were permitted to enlarge eventually the pressure within it aided by hand pressure above the pubes would overcome the sphincter guard and urine would begin to dribble away through its natural passage. Thus would be established an incontinence of retention which would slowly and continuously drain off the retained urine. This distention is accompanied by some dilatation of the ureters and the pelves of the kidney but is comparatively innocuous. A bladder in this condition does not burst. The patient may gradually regain some bladder control and be able to reduce the amount of residual urine to a very few ounces. That is a bearable condition and is strongly contrasted to what usually happens.

The friends or medical attendant become alarmed at an absence of urine. The catheter is resorted to and infection follows. No matter how carefully catheterization is performed infection is surely introduced usually the very first time and not to a *normal* bladder but to a paralyzed and distended one.

Resistance is low urine is stagnant and retained and rapidly a severe cystitis followed by an ascending infection with pyelitis and pyelonephrosis develops with death from kidney abscesses or destruction. This death is not unfailing for men have lived for years with these kidney infections but the average individual with a clean genito-urinary tract rapidly succumbs.

When incontinence of retention is secured emptying of the bladder may be encouraged by use of the abdominal muscles if unparalyzed or by gently stroking the inner side of the thighs to obtain a mass reflex and emptying of the bladder by sphincter relaxation.

The usual cause of death after compression fracture of the spine with cord symptoms is infection of the urinary tract with or without perinephritic abscesses and peritonitis. Pressure sores leading to terminal metastatic foci may be the cause or rarely venous thrombosis and embolism.

The history following with descriptions of two autopsies given in detail illustrate the pathology and lead to a discussion of the treatment especially treatment of those patients who suffer cord symptoms at the time of injury.

A thirty eight year old man was injured while driving his automobile on July 2 1922 when he was forced into the ditch and his motor was overturned. His back was injured so that he had complete sensory and motor paralysis from the waist down. His rectal mucosa pouted out of a distended anus and he passed no urine. A gibbus was found at the twelfth dorsal and first lumbar vertebræ. Within twenty four hours I performed a laminectomy extending from the eleventh dorsal to third lumbar vertebræ and exposed a compressed and angulated cord. The twelfth dorsal spine was rotated to the right and the whole vertebra was dislocated forward so that the cord was pinched between the arches of the twelfth dorsal and the body of the first lumbar vertebræ. The dura of the cord seemed unruptured. There were some extradural clots and hemorrhage but the cord did not bulge beneath the dura as if it were full of blood. Rather it was felt to be pinched. All bony pressure was removed and the wound was closed with a capillary drain.

The patient was placed on a water bed. Two days later the bladder not having started to empty itself the attending doctor catheterized him and obtained 36 ounces. This contained some pus cells on microscopic examination. Within two more days tactile sensation returned in his legs to nearly the ankle. He passed a large involuntary bowel movement and the anus seemed less pouting. Inasmuch as the bladder still refused to empty itself and it was felt that he may have had some cystitis or urethritis at the time of injury a retention catheter was introduced into the bladder to keep the urinary tract completely drained. The bladder was washed out daily with boric acid solution and some 10 per cent argyrol solution was always left in the bladder after the irrigation. Three weeks later he was transferred to the Presbyterian Hospital and this same type of treatment continued. He had a water bed, excellent nursing attention and daily massage of his paralyzed limbs. Sensation never quite reached his toes but he became able to flex his thighs and move the calf muscles slightly.

After a few weeks the urinary tract remaining aseptic his catheter was removed for periods of eight to twelve hours at a time to see if bladder function could not be encouraged to return. There never was much gain, however. About this time a small burn occurred on one buttock when he was left sitting on a hot water bag in an effort to induce urination. This was slowly healing with some infection.

The patient was now allowed up in a wheel chair and a special movable frame was built in which he could be lifted and allowed to bear weight on his feet and exercise his leg muscles. Into this he was put daily and with the help of 2 orderlies was walked about on crutches.

Nearly three months after injury he developed a sudden chill with temperature rise and edema in one leg. His exercise and wheel chair privileges were stopped and massage was interdicted. The urine remained normal during this time. Slowly the leg swelling improved and within a few weeks he was again encouraged to be up. After a short period the opposite leg suddenly underwent the same type of swelling accompanied

by a chill and fever so that he again was confined to bed. About three weeks before death which occurred on December 3 1922 he developed sharp pain in the left side of his chest accompanied by some dyspnea and pain over the kidney region on deep inspiration. Kidney infection was considered but the urine still showed no untoward findings and a tender organ was not palpable. A few rales were found in his chest but no dullness later some pleuritic rub manifested itself. His condition gradually became weaker and he passed away with marked dyspnea and cyanosis the leg swelling remaining and the chest finding being still undiagnostic. We believed that he had a thrombosis of the thigh with pulmonary infarct.

**Autopsy.** Anatomic diagnosis: Traumatic fracture dislocation of first lumbar vertebra compressed spinal cord. Thrombosis of right common iliac vein diffuse hemorrhagic multiple infarcts of lungs with passive hyperemia and edema localized fibrinous pleuritis anasarca of right lower extremity solitary left kidney acute simple cystitis ureteritis and pyelitis (slight reddening of lining old process) thrombosis of branch of renal vein hypertrophy of the bladder marked hyperplasia of the spleen fatty changes in liver and kidney lessened yellow material of the adrenal cortices urunculosis of buttock laminectomy scar some long since absent teeth. Much of the remaining description of the autopsy findings are omitted because they have little bearing on the subject in hand. A portion of the spinal column (Fig 470 A) was removed. It consisted of an area from tenth thoracic vertebra to the fourth lumbar inclusive. A distinct slipping forward of the twelfth thoracic vertebra was noticed. The middle of the body of the first lumbar vertebra presented a deep encircling furrow running at a right angled plane to the long axis of the spine. At the lower part of the furrow like constriction there was rough irregular bone and on the right side close to the transverse process there was a hard projection of new bone formation which extended half way up on to the twelfth thoracic vertebra and for at least 2 cm. to the right. That portion of the spine above the lumbar vertebræ formed an angle of about 5 degrees with the lower portion because of

a sudden angular bend to the right at the junction of the thoracic and lumbar portions. When the spinal canal was opened the cord was found surrounded by considerable old hemorrhage which extended from the tenth thoracic vertebra to the fourth

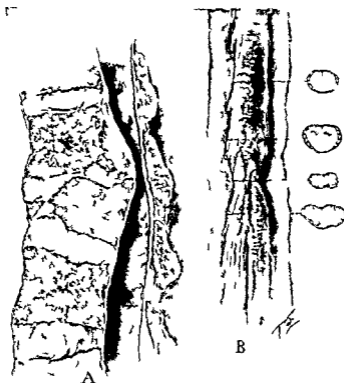


Fig 470—A Sagittal section of spinal canal showing injury to the cord. B Spinal cord showing hemorrhage and penetration of injury. Note increased number of blood vessels which have invaded the dura mater to the car of the injury and destruction. Also low cross section made at various levels at the site of the hemorrhage to the cord.

lumbar inclusive. The spinous processes of the eleventh and twelfth thoracic and first lumbar vertebrae were wanting having been removed by surgical operation. In the peridural region at the operation level much fibrous tissue was found the dura being much thickened and adherent to this fibrous tissue. When

all the spinous processes were removed and the cord was exposed a sudden angulation in the cord posteriorly is seen at the level of the junction of the twelfth thoracic with the first lumbar vertebra. Here also is old subdural cord hemorrhage (Fig 470 B). The anterior displacement of the twelfth thoracic had made definite pressure on the spinal cord. Soft grayish broken down material escaped through the dura of the cord at the level of the first lumbar vertebra. On section the centers of the bodies of the vertebræ contained vacant spaces as though there had been bone absorption except the first lumbar which seemed to the naked eye much denser and more compressed.

Within a few days of the death of this patient a second death following compression fracture of the spine occurred in a neighboring bed on the service of Dr Parker. His patient was injured in an automobile accident just a few days after the man I have described. He was eighteen years old and for eight weeks after his injury was treated elsewhere being admitted to the Presbyterian Hospital October 8, 1922 with death December 18, 1922. Both autopsies were performed by Dr Oberhelman who must be thanked for painstaking notes and careful examination.

This second patient on admission presented a gibbus in the region of the first lumbar vertebra, was paralyzed in both legs, could not urinate, had burning sensations in his bladder and a pressure sore on his back. Nine days after his accident some sensation had begun to return to his legs and after two weeks he could move the right thigh slightly. Sensation ultimately returned except over the toes of both feet. For the first few weeks after his accident he had been unable to urinate and had been catheterized at irregular intervals but later he had regained control of both anus and bladder passing his urine however only by great straining effort. There was much burning after urination and a residual urine of 10 to 12 ounces was found. He had also suffered from chills before admission.

He was examined cystoscopically and a high grade cystitis was found, cultures of the urine showing staphylococci. At a second cystoscopy the pelves of the kidney were irrigated with

boric acid solution. Later an epididymitis developed followed by prostatic abscess with signs of kidney infection.

**Autopsy.** The anatomic diagnosis was compression fracture of the first and second lumbar vertebræ. Extra and subdural hemorrhage of the lumbar cord, hemorrhagic softening of the cauda of the cord, marked atrophy of the muscles of the lower extremity, marked plantar flexion of the feet, ascending cystouretero-pyelonephritis, markedly dilated ureters, localized intramural abscess of the urinary bladder wall, huge decubital ulceration of the sacrum, suppurative osteomyelitis of the sacrum, thrombosis of the left common iliac vein, purulent right otitis media, moderate edema of the leptomeninges, early hypostatic bronchopneumonia, hyperplasia of the pelvic peri-aortic and mesenteric lymph glands, general emaciation and anemia, cloudy swelling of the liver and myocardium, fatty changes of the heart, liver and kidneys, lessened yellow material of the adrenal cortices, petechial hemorrhages beneath the lining of the stomach and duodenum, fibrous adhesions between the spleen and diaphragm, bilateral fibrous pleuritis, pigmentation of the skin of the abdomen and extremities, caly skin of the abdomen, accumbent spleen.

From the external urethral orifice there was expressed yellow purulent fluid. The lower extremities were greatly emaciated, the muscles soft and small. Over the sacrum there was a round ulcerated area 9 cm. in diameter, the base of which was dark red tissue and in its center the rough and eroded sacrum was seen together with the coccyx. There are also pressure sores over the ischial tuberosity and at the level of the twelfth thoracic and first three lumbar vertebræ. At this point there is a slight kyphosis, but no abnormal point of motion of the bones can be found.

In the peritoneal cavity was a small amount of pale yellow slightly turbid fluid. Many loops of the small bowel were matted together by fibrous and fibrinous adhesions, mainly in the pelvis and right lower quadrant of the abdomen. Deeper down in the pelvis the fluid was purulent and was confined in a well-defined pocket walled by loops of bowel, bladder and rectum. The

transverse colon formed a U shaped figure in the midline. The abscess pocket burrowed down along the left wall of the pelvis to its base with the sigmoid forming the left wall. The large bowel was entirely filled with firm fecal masses. The viscera forming the walls of this abscess were covered with a layer of thick fibrin. On the fundus of the urinary bladder there was a soft yellowish red area 3 cm. in diameter. When a small amount of pressure was applied here blood stained purulent fluid escaped apparently from the urinary bladder. A perforation about 2 mm. in diameter is found leading into this area and when the bladder is cut open this small opening leads into an abscess 2 cm. in diameter in the wall of the bladder. There was no gross evidence of communication between the inside of the bladder and this abscess in the wall of the bladder.

Both ureters were markedly dilated the right 1.8 cm. in diameter the left 1.2 cm. When an incision was made to remove the structures in the pelvis in the usual manner a small pocket of pus was cut into. This was contained in a cavity bound in front by the posterior margin of the symphysis pubis below by the skin of the peritoneum above by the prostate and behind by the wall of the rectum. There was practically no prostate remaining except a small mass in the posterior part the rest being destroyed by suppuration. The wall of the urinary bladder had a maximum thickness of 1.2 cm. Its lining was grayish green with black areas in many places and the blood vessels beneath the lining were tortuous and distended. The bladder mucosa was 2 mm. thick and was fairly well intact covered however by a thin layer of fibrin.

There was more than ordinary amount of motion of the spine at the level of the first and second lumbar vertebræ. Most of this however was located at the intervertebral disk between the first and second lumbar. All the intervertebral disks were soft and spongy.

Numerous fibrous adhesions existed between the right kidney and the perirenal tissues. The right kidney was somewhat enlarged semifluctuant and yellowish brown in color. The capsule was adherent to the parenchyma and when stripped

boric acid solution. Later an epididymitis developed followed by prostatic abscess with signs of kidney infection.

**Autopsy.** The anatomic diagnosis was compression fracture of the first and second lumbar vertebrae. Extra and subdural hemorrhage of the lumbar cord, hemorrhagic softening of the cauda of the cord, marked atrophy of the muscles of the lower extremity, marked plantar flexion of the feet, ascending cystouretero-pyelonephritis, markedly dilated ureters, localized intramural abscess of the urinary bladder wall, huge decubital ulceration of the sacrum, suppurative osteomyelitis of the sacrum, thrombosis of the left common iliac vein, purulent right otitis media, moderate edema of the leptomeninges, early hypostatic bronchopneumonia, hyperplasia of the pelvic periaortic and mesenteric lymph glands, general emaciation and anemia, cloudy swelling of the liver and myocardium, fatty changes of the heart, liver and kidneys, lessened yellow material of the adrenal cortices, petechial hemorrhages beneath the lining of the stomach and duodenum, fibrous adhesions between the spleen and diaphragm, bilateral fibrous pleuritis, pigmentation of the skin of the abdomen and extremities, scaly skin of the abdomen, accessory spleen.

From the external urethral orifice there was expressed yellow purulent fluid. The lower extremities were greatly emaciated, the muscles soft and small. Over the sacrum there was a round ulcerated area 9 cm. in diameter, the base of which was dark red tissue and in its center the rough and eroded sacrum was seen together with the coccyx. There are also pressure sores over the ischial tuberosity and at the level of the twelfth thoracic and first three lumbar vertebrae. At this point there is a slight kyphosis but no abnormal point of motion of the bones can be found.

In the peritoneal cavity was a small amount of pale yellow slightly turbid fluid. Many loops of the small bowel were matted together by fibrous and fibrinous adhesions, mainly in the pelvis and right lower quadrant of the abdomen. Deeper down in the pelvis the fluid was purulent and was confined in a well defined pocket walled by loops of bowel, bladder and rectum. The

thoracic down to the fourth lumbar vertebra. The distance between the lower margin of the twelfth thoracic vertebra to the upper margin of the second lumbar vertebra on the right side was 4.1 cm. Measured from a similar location on the left side it was 2.8 cm. These measurements included the intervertebral disk both above and below the first lumbar vertebra. The height of the first lumbar vertebra itself on the right side was 2.8 cm, on the left side 1.6 cm. There was considerable roughening of the left side of the bony surface of this first lumbar vertebra. Because of the difference in the vertical height of the two sides of the first lumbar vertebra there was a bend to the right of this part of the spine so that the upper part of the spine made an angle of about 10 degrees with the vertical plane of the lower portion. All the intervertebral disks were very soft and spongy. The maximum width of the first lumbar intervertebral disk was 1.3 cm on the right side and 0.9 on the left. That of the disk between the twelfth thoracic and first lumbar vertebrae on the right side was 0.5 on the left 0.4 and of the middle in front was 0.7 cm. There was blood about the dura of the cauda equina and about the cord at the level of the twelfth thoracic and first lumbar vertebrae. Here the fat was red to brown in color because of old blood in it. Fibrous adhesions were present between the dura on the front of the cord and the bony canal at the level of the first lumbar vertebra so that when the cord was removed a part of the dura remained adherent to the lining of the spinal canal. A marked prominence in the spinal canal was present the upper margin of which lay at the level of the junction of the twelfth thoracic and first lumbar vertebrae. This prominence was 4 cm in height and 1 cm from front to back while its width was equal to that of the transverse diameter of the spinal canal. Its upper surface was almost at right angles to the vertical diameter of the twelfth thoracic vertebra and it represented a marked backward displacement of the first lumbar vertebra in its relation to the twelfth thoracic. At this level the cord was yellowish brown soft and very friable. At the level of the second and third lumbar vertebrae the cauda was also stained brown. The maximum front to back diameter

of the spinal canal was just above the lower margin of the twelfth thoracic vertebra equaling 1.5 cm. The smallest diameter which is 0.5 cm. was just below this so that there was caused a marked flattening of the spinal cord at this level.

**Treatment**—No matter how evident the patient's symptoms of complete cord severance may be we should always give him the benefit of doubt in advising operation for decompression of the cord. When shock is not a factor to be considered and the patient's general condition is such that he will stand operation laminectomy at once may relieve pressure on the cord caused by hemorrhage and edema.

When the cord has been cut in two no operation will be of avail however all the symptoms of complete severance may be merely simulated. Laminectomy might be possible where complete roentgenologic examination is not available. Allen's procedure may be adopted without increasing the amount of permanent damage to neurons and the cord after opening the dura may be incised in its longitudinal axis to afford drainage of blood and edema.

Laminectomy must be carried to a point well beyond the pathology present in both bony and nervous spines then it promises a maximum amount of return of function in those cells and neurons not completely destroyed. When the cauda has been torn it may be successfully sutured.

If no operation is performed in the presence of paralytic findings the future care of the patient is the same as if laminectomy had been undertaken. Nursing care must be constant to obtain frequent change of position and to avoid constant pressure over points of the body such as the heels and buttocks. Along with that goes the necessity for cleanliness to guard against skin contamination by urine and feces which may be evacuated without the patient's knowledge. A water or air bed is almost an absolute necessity in nursing care. When the bowels become distended from retained gas and feces colonic flushing is indicated even the digital removal of in-pissated masses from the rectum may be required.

The bladder and urinary tracts require incessant care. One

of two policies is usually adopted first the bladder is allowed to distend until it reaches that point where aided by suprapubic pressure an overflow begins through the forcibly opened sphincter. This may be aided by gently stroking the inner side of the thighs. The urine is obtained by catching it in the urinal which is constantly in place. When there is priapism this problem becomes quite difficult. For pain from the distended bladder or priapism small doses of morphin may be given but they have an untoward effect on the bowel. This incontinence of retention is carried on indefinitely until the patient regains some control over the act of urination and no infection of the urinary tract should result.

The second policy is the one commonly adopted namely catheterization of the patient early perhaps only a few hours after the accident. My main idea today is to induce practitioners to abandon catheterization because when repeated at irregular intervals the patient soon develops cystitis and its sequelæ. If catheterization has been performed and infection has been started I believe that constant drainage of the urinary tract becomes imperative. This cannot be accomplished by ordinary catheterization but must be secured by means of an indwelling catheter removed only when necessary to cleanse away phosphatic or mucous accumulations. The bladder should be washed out once in every twenty four hours with sterile boric solution and a few ounces of 10 per cent argyrol solution should be left in the bladder. The constant drainage by the catheter removes all pressure within the urinary tract and with the help of urinary antiseptics administered by mouth promises to keep any infection below a danger level. A patient with a well developed cystitis and urinary tract infection requires suprapubic cystotomy with proper tight drainage and bladder irrigation. I believe also that cystoscopy is absolutely contraindicated for these patients it adds to the severity of the infection and may set up other foci of infection. Cystotomy may help but surely catheterization of the ureters and pelvic lavage of the kidneys will lead to no benefit in these patients when the bladder outlet is paralyzed. There is no necessity



Fig 471—Drawing of a lateral view of the spine. The illustration shows the vertebral column from the side, with the ribs branching off. The spine is depicted as a series of vertebrae, with the lumbar region (lower back) being the focus of the drawing. The drawing is labeled with various anatomical terms, including 'lateral view', 'spine', 'vertebrae', 'lumbar', 'thoracic', and 'cervical'.

for investigating the inside of the bladder in this type of infection

After the patient has settled into his routine and pending the arrival of power in his leg muscles daily massage with movements of all joints in the paralyzed area is indicated. Every effort should be made to keep the peripheral circulation in a normal condition and yet blood vessel walls must not be traumatized to favor the formation of mural thrombi. When the urinary tract is even slightly septic the blood stream may contain bacteria which eagerly seize any opportunity to form thrombi in the veins. The patient should be turned from side to side in the bed encouraged to raise his body and arms and exercise his trunk so that as soon as he is able he can be stood up and encouraged to attempt leg movements. We use a monkey pole over the bed within easy reach. The upright position may hasten return of bladder control. A plaster of Paris molded corset is applied before the patient is permitted to get up at all.

Should thrombosis appear and leg swelling become evident we must avoid embolism by again confining the patient to bed. The prognosis becomes very bad. In a few recorded instances however men have lived for years with severe infections in the urinary tract and complete loss of leg power.

Compression fracture without nerve symptoms—at least gross symptoms—is being recognized. Pain constant dull or rather severe is the outstanding symptom. Usually in such an instance the pathology is simple that is the corpus of the vertebra is compressed but there are no complicating changes. After a few months the patient whose spine has gone unsupported in body weight bearing has a steady increase in back pain and ultimately develops nerve symptoms. These may first attack the bladder leading to difficulty in urination or sudden urinary incontinence. Leg paralysis may follow rapidly some times preceded by paresis in certain muscle groups.

Such a compression fracture requires spinal support from the very start. This is generally provided for by a plaster-of-Paris corset made to be removed at night when the patient goes to bed and takes weight bearing off his spine. Robust men or others who do not wish to put up with the uncertainty of a cure

and spinal immobilization by the plaster corset can be offered spinal fixation by bone graft For working men I sometimes perform this operation as soon as a diagnosis is made before cord pressure symptoms supervene

## CLINIC OF DRS EDWARD LOUIS AND LOUIS D MOORHEAD

MERCY HOSPITAL

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### DOUBLE INTUSSUSCEPTION OF THE UPPER JEJUNUM

Patient Brought to Hospital with Diagnosis of Obstruction at the Pyloric End of Stomach and at the Beginning of the Jejunum Operation Revealed a Double Intussusception of the Upper Jejunum Discussion of Intussusception

THIS patient is brought before the class today on account of the interesting history he gave the preoperative diagnosis which was made and the pathologic findings at operation. It is an illustration of the old saying that the diagnosis of intra abdominal conditions is often made after the abdomen is opened. The patient was brought to my clinic for operation October 29 1922. His attending physician stated that there was an obstruction at the pyloric end of the stomach and also at the beginning of the jejunum. This statement was based upon the history the physical examination and the x ray examination. The history is as follows. Male aged fifty four years. Laborer. For the last six years he has had gastric distress. Vomited nearly every morning after eating breakfast. There was no special pain associated with the vomiting.

Two weeks before the patient entered the hospital he was seized with a sudden severe attack of generalized abdominal pain. Pain was so severe that it doubled him up and he was compelled to lie down. He did not vomit at this time. He was given some medicine by a druggist but obtained no relief from the pain until late that evening and after applying heat to the abdomen by the use of hot water bottles.

During the night the bowels moved and by the next morning

he felt fairly comfortable. There was no history of having passed blood with feces at any time. For the two weeks intervening between the attack and the time he entered the hospital he remained in bed at home. He felt very weak and was unable to take any nourishment except liquids. There was considerable distress in the upper abdomen. During the past three months he had lost 30 pounds in weight. There is no history of previous illness except the gastric distress, constipation and vomiting, as previously stated. There is nothing in the family history that might have a bearing on the case.

**Physical Examination**—Head and neck negative. Chest and lungs. Apices full, well breath sounds normal. Heart. No increased cardiac dulness, no murmurs. Abdomen. Distended but not very rigid. No palpable tumor mass but an area of tenderness in epigastric and left hypochondriac region. Spleen not palpable. Liver not enlarged. Genito urinary system negative.

**Radiologist's Report**—Chest. The fluoroscopic examination showed the hilar markings definite. There was a slight lateral enlargement of the arch of the aorta. The right diaphragm did not move freely upon deep inspiration and showed a slight irregularity. Stomach. The fluoroscopic examination by means of the barium meal showed no lagging in the esophagus. The stomach reached 2 inches below the crest of the ileum. The peristalsis was active. The pyloric antrum and duodenum appeared to be considerably displaced to the left. The emulsion passed from the stomach into the first portion of the duodenum in canalization form. When the emulsion reached the junction of the third portion of the duodenum and the jejunum there appeared to be a considerable fixation causing rather marked dilatation in the third portion of the duodenum. From this point several reverse peristalses were observed during the fluoroscopic examination.

The radiograms taken immediately after are confirmatory of the fluoroscopic findings. They further show practically an absence of the entire pyloric antrum. The five hour radiogram shows nearly 30 per cent. of the emulsion in the stomach.

*Conclusions* —Possibly pancreatic malignancy involving the pylorus and duodenal region with possibilities of adhesions causing partial constriction at the junction of the third portion of the duodenum and jejunum

Upon presentation of the foregoing history and x ray report it was suggested that the patient would be benefited by an operation if the obstruction could be relieved by freeing adhesions and perhaps performing gastrojejunostomy or such other surgical procedure as the conditions might require

*Operation* —Ether anesthesia Incision to right of midline from ensiform to level of umbilicus Right rectus displaced outward Peritoneum opened The anterior surface of stomach was found to be rather firmly adherent to the parietal peritoneum of the abdominal wall This was separated very gently until the stomach could be *delivered* At the pyloric end of the stomach and the first portion of the duodenum the adhesions were found to be quite dense due no doubt to a peritonitis at some time from a pre existing duodenal ulcer The freeing of these adhesions was carried only so far as to allow the stomach to be delivered in the abdominal wound and to feel assured that the pyloric obstruction was relieved Attention was next directed to the dilated third portion of the duodenum and beginning of the jejunum Here was found a soft cylindric tumor mass about  $2\frac{1}{2}$  inches in diameter and 10 inches in length It proved to be an intussusception of the jejunum extending downward from about  $1\frac{1}{2}$  inches from the beginning of the jejunum The lower portion of the tumor mass was curved toward the midline and slightly upward the concavity being directed toward the mesenteric portion of the intestine The intussusception was released without much difficulty but it was discovered that instead of a single intussusception it was double that is the original intussusception had invaginated into the bowel immediately below it As the last portion of the invagination was released there was found in the wall of the jejunum a hard tumor about the size of a hen's egg This was the starting point or apex of the intussusception The tumor was enucleated by incising the serosa of the bowel and separating the muscularis

and the resulting wound of intestine closed by two rows of sutures. The mucosa was not incised and consequently the lumen of the bowel was not opened. After applying warm moist pads for a short time to the bowel involved in the intussusception the circulation in the bowel improved. The bowel was returned to the abdomen, the peritoneal toilet completed and the abdomen closed in the usual manner. In the after treatment nothing was given by mouth for seventy-two hours. Fluids were given per rectum. After the first seventy-two hours fluids were given by mouth and gradually the diet was increased until by the eighth day he was on a fairly liberal diet. There was no postoperative vomiting, no special pain, bowels moved on fourth day without any assistance. Patient was up and around at the end of two weeks. Convalescence was uneventful.

Pathologist's report states that tumor of intestinal wall is a fibroma.

It is now ten weeks since the operation. Patient states that he has gained 15 pounds in weight and has not taken a cathartic since the operation, the bowels moving regularly without their use. His appetite is good and there is no further gastric distress. In this connection it is interesting to compare the x-ray plates and fluoroscopic examinations made before and after operation. While in the preoperative plate and fluoroscopic examination the report stated that the pyloric antrum and duodenum appeared to be considerably displaced to the left and that the emulsion passed from the stomach into the first portion of the duodenum in canalization form and that the third portion of the duodenum was dilated and in the five-hour picture 30 per cent of the emulsion was found to remain in the stomach, the postoperative reports state that the pyloric obstruction has been relieved, there is no deformity of the duodenal cap and the emulsion passes through the third portion of the duodenum without any obstruction. The five-hour picture shows the stomach empty and no evidence of the intussusception.

A review of medical literature on the rôle of tumors of the small bowel in the production of intussusception reveals some

interesting facts. The paucity of cases reported since 1915 is striking. The greater number are to be found previous to that date. Heurtaux in his investigations, collected 50 cases, and these were distributed as follows: Fibroma 3, adenoma 1, myoma, 32, lipoma 8, angioma 3. King covering the literature for the same period found 65 cases, but his proportional distribution is similar to the above. Elliot and Corcoran working together and Kasemeyer and Steten working independently report a somewhat larger total of cases but do not give the pathologic distribution.

A consideration of the above records as well as a review of the cases reported since that time emphasize the rareness in which a fibroma is the offending tumor in the production of intussusception as well as the fact that in most cases does the tumor occur at a lower place in the intestinal wall. The existence of an intramural affair is uncommon as in nearly all instances the tumor is within the lumen of the bowel.

One of the common forms of intestinal obstruction is intussusception that is the prolapse of one part of the intestine into the interior of another immediately adjoining. If a section is made through an intussusception three layers of intestine are divided: the innermost or entering layer, the outermost or sheath, and the middle or returning one in which the mucous surface is outside facing the mucous surface of the sheath and the peritoneal inside facing that of the entering layer. The two inner layers are known as the intussusceptum. In the present case on account of the intussusception being double five layers of intestine would have been found upon section.

The mesentery of course is carried in with the bowel lying between the peritoneal surfaces of the inner layers and dragging the intussusception into a cone the apex of which lies at the point the base at the neck. A certain amount of elongation is necessary to allow this but owing to the direction taken by the bowel not so much as might be expected and an ileocecal intussusception can reach the rectum within a few hours the increased length is not due merely to stretching. The effect of this traction is in general to throw the intestine into a curve

and to tilt up the orifice of the intussusceptum so that it has the aspect of a slit and looks toward the side of the bowel rather than down the axis. Intussusception exists in two different forms. In the common one the apex of the invagination never changes the part that entered first continues in front throughout and the increase is entirely at the expense of the sheathing layer in the other (ileocolic) which only occurs at one part of the intestine and is rare there the ileum slips farther and farther down the colon through the valve without the cecum following it the increase is entirely at the expense of the small intestine and the apex is constantly shifting. Not infrequently after a time this variety changes into the other.

The four usual varieties of intussusception are first the ileocecal. This is the most common form and constitutes 44 per cent of all cases. In it the ileocecal valve forms the apex and owing to the great mobility of the ileum a considerable portion of the bowel may be invaginated passing through the colon and rectum and appearing even at the anus. Second the enteric variety involving the small intestine usually the lower jejunum and rarely of great size accounts for about 30 per cent. Third the colic form may occur at any part of the colon or rectum and owing to the fixity of this portion of the gut is limited in extent and occurs in about 18 per cent of the cases. Fourth the ileocolic in which the ileum is prolapsed through the ileocecal valve which for a time retains its normal position but after the intussusception has attained a certain size the valve and cecum are also invaginated into the ascending colon. This variety constitutes about 8 per cent of all the cases.

The frequency with which ileocecal intussusception occurs is due to some extent to the difference in size between the two parts and to the fixed position of the cecum. There is a very close analogy between the sphincter like ileocecal valve and the sphincter of the rectum and between the invagination that takes place at the one and the prolapse that occurs with equal frequency especially in children at the other.

Ileocecal tenesmus probably sets in whenever there is any violent catarrh or abdominal irritability of the intestine just

as anal tenesmus occurs in similar conditions of the rectum and the repeated and forcible peristalsis driving down on to the firmly closed ileocecal valve causes intussusception in the one case just as it causes prolapse of the rectum in the other. If the cecum is freely movable as it usually is in children ileocecal intussusception occurs if on the other hand it is fixed as in adults ileocolic. When once the invagination has commenced the contact of the swollen and congested apex stimulating the walls of the intestine below tends to make it increase indefinitely. In many of the cases of intussusception no exciting cause can be found. It is undoubtedly more common in delicate patients than in those who are strong and robust. In most instances where there is a definite reason for its occurrence it has followed diarrhea free purgation or colic due to the presence of undigested food. Possibly slight degrees of it undergoing spontaneous reduction occur more commonly than is usually imagined in severe colic attended with great prostration. In some instances it has followed injury blows upon the abdomen or jumping a child up and down and there is no doubt that the presence of polypi or fibrous tumors of the intestine predispose to it.

The method of production is much the same whether the intussusception is due to paralysis or to spasmodic contraction (which is the more usual of the two) affecting one segment of the bowel. The intestines above scarcely take any share in the proceeding the longitudinal fibers simply keep drawing the bowel from below over the narrowed part until an invagination is produced and the apex has become swollen and congested. The effect on the intestine of an intussusception chiefly concerns the invaginated part and its mesentery. The sheath may escape altogether although sometimes it becomes gangrenous and the part above at first shows scarcely any change later it may be dilated and the walls hypertrophied or ulceration may occur and end in perforation. It all depends upon the character of the constriction where this is very tight the bowel inside becomes intensely congested blood pours out from the mucous membranes the walls become thickened and almost solid especially along the convexity and at the apex and the intus

suscepted part soon becomes gangrenous. The middle layer usually suffers the most severely. In some instances the whole invagination is destroyed and comes away in a mass, the separation taking place at the neck. More frequently it is detached in shreds and occasionally the inner coat is gradually cut off from the rest, unfolded and passed with the middle layer turned inside out. Where the constriction is less severe a low form of inflammation sets in, the walls become thickened, adhesions form between the peritoneal surfaces, sometimes at the neck only, but more frequently wherever they are in contact, and if the patient lives the whole of the intussuscepted part may at length slough off. Very often the intussusception is irreducible even where there are no adhesions—the walls are so thickened especially along the convexity and the apex is swollen out to such an extent that the tissues cannot be unfolded without being torn. The same result may follow from twisting of the bowel inside the sheath, from rigid contraction of the ileocecal valve, or from the presence of a polypus springing from the mucous membrane, or a fibrous tumor of the intestinal wall.

Where the constriction is very lax there may be scarcely any alteration even after months, but not unfrequently after some little time the symptoms suddenly change and become acute. Peritoneal adhesions are more common in chronic than in acute cases, and often render reduction impossible. Sometimes they are only at the neck, or they may be general, or limited to the first part invaginated, so that the whole can be reduced with the exception of the last few inches. The walls of the bowel above are hypertrophied, sometimes there is considerable distention owing to the narrowing of the passage by the swelling and bending of the intussuscepted part. Ulceration may occur, but when the bowel becomes gangrenous the process is usually more gradual than in the acute cases. It may involve the mucous membrane only, or it may begin at the apex of the invagination and extend slowly upward.

Acute intussusception occurs most frequently in children, more than half of the cases being under ten years of age, the large proportion during infancy. The onset is sudden, attended

with severe pain more or less paroxysmal at first, but rapidly becoming continuous and diffused over the abdomen. Vomiting usually follows but is not so constant or severe as in acute strangulation. Absolute constipation is hardly ever present but diarrhea and the discharge of blood and mucus from the anus with well marked tenesmus are common. Collapse soon supervenes and may be so severe as to result in death within twenty-four hours or death may follow as a result of exhaustion or peritonitis in a few days or a week. Unless peritonitis is present there will not be much distention or tenderness of the abdomen. In many cases a distinct tumor can be palpated. It is usually described as sausage shaped following the course of the intussusception and generally curved owing to the traction on the mesentery. In the ileocecal variety it extends from the right iliac fossa across the brim of the pelvis to the left the colon being dragged downward. In other cases the tumor may be more limited and distinctly movable. A rectal examination should always be made as frequently the tumor may be palpated in this way.

**Treatment**—Acute intussusception differs from the other forms of intestinal obstruction in the fact that a certain proportion of cases recover spontaneously the bowel either releasing itself or becoming gangrenous and sloughing off. How often the former of these occurs it is impossible to say probably it takes place in many of the cases of severe intestinal colic in which opium gives such complete relief but there is no means of proving it. The latter is too exceptional in occurrence especially in the young to deserve any reliance and it is probable that it is much more rare than statistics show. Besides even when it does happen over 50 per cent of the patients die from effects directly connected with the process the separation is premature or the ulceration continues and leads to perforation or hemorrhage occurs or the patient dies from prolonged exhaustion. Enemata are often successful in the early stages especially when the large intestine only is concerned. When the tumor is to be felt on the right side or even in the midline the chances are much less and if inflammation has set in and

caused the formation of adhesions or if the intussuscepted part has become thickened from long standing congestion success is out of the question the bowel will give way sooner than unfold

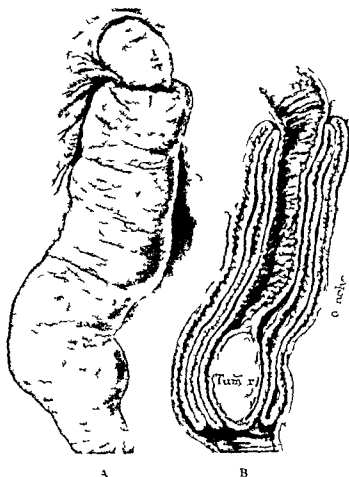


Fig 472—A Appearance of the intussusception at delivery before attempt at reduction. Note the closeness of the mouth of the intussuscepted part to the beginning of the jejunum and the unfolding of the mesentery. B Cross section showing the double intussusception and the location of the fibrinous material in the lumen.

Insufflation with air has been recommended on the ground that the bowel is not so likely to be ruptured on the other hand

water has succeeded after air has been tried and failed. Moreover, the quantity of water used can be measured more easily. Should these measures not succeed operation is indicated. In reducing an acute intussusception the mass should if possible be brought outside the abdomen. Traction should not be made upon the intussusception but reduction should be effected by squeezing the intestine below the intussusceptum and so forcing it out. Should reduction be impossible by this means resection or other operative procedure on the intestine itself is indicated. In case any gangrene exists at the neck no attempt should be made at reduction. Pressure should be firm gentle and continuous. Any injury to the peritoneal coat of the intestine should be carefully sutured after reduction. If the intussusception is irreducible but not gangrenous resection of the entire mass is advisable if the patient's condition is good. If gangrene exists excision of the mass with lateral anastomosis or excision with the formation of an artificial anus is indicated. In some cases the patient's condition is so bad that no more can be done than to bring the affected intestine outside the abdomen while rapidly forming an artificial anus above the site of obstruction. In other cases there may be time to perform a lateral anastomosis in addition to this procedure.

Chronic intussusception is more favorable in its prognosis. It is frequently unrecognized until an exploration of the abdomen is made. In some cases the intussusception may be reduced by simple manipulation but as a rule too many adhesions are present and it will be necessary to make a resection of the affected bowel and a lateral anastomosis.

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## CLINIC OF DR VERNON C DAVID

PRESBYTERIAN HOSPITAL

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### CONGENITAL STRICTURE OF THE RECTUM IN CHILDREN

Four Cases Illustrating Different Phases of Congenital Malformations at the Anal Opening of the Bowel Discussion of Anal Malformations Treatment Employed in Present Cases

WE are asked to examine an infant patient who comes to the hospital with the complaint of heart trouble failure to gain and distention of the abdomen

Case I—Female F M aged sixteen months enters the Presbyterian Hospital on the service of Dr Walter F Winholt The patient's complaints are heart trouble failure to gain and distended abdomen Since birth the abdomen has been distended, but more so during the past three months The child has had bowel movements which are greenish yellow and not watery Her weight at birth was 5 pounds 5 ounces and this weight has increased to between 9 and 10 pounds and remains stationary at that point

Physical examination reveals a pale underdeveloped poorly nourished child with a distended abdomen The abdomen is filled with a tumor reaching from the symphysis to the ensiform which is doughy and can be pitted on pressure The abdominal wall is thin but when attempts are made to palpate the tumor marked rigidity of the abdominal muscles results The heart is enlarged to the right and left and a marked systolic blow is heard at the apex which is transmitted over the entire chest The posterior cervical and axillary lymphatic glands are enlarged

Rectal examinations reveal a very hard mass completely filling the rectum and bulging into the anal region which is with difficulty differentiated from a bony deformity of the pelvis or from a bony tumor from the pelvis. It is in reality the lower border of a fecal impaction. This is almost entirely separated

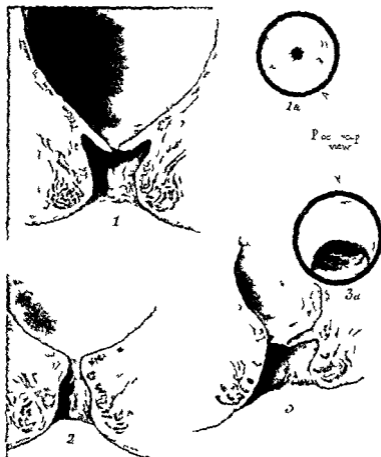


Fig 473—Different type of congenital rectal structures

from the examining finger by a diaphragm of mucosa which is about 3 cm distant from the anal orifice and in the center of which is a small opening. This obstructing membrane resembles in form the iris of the eye with the central opening corresponding to the pupil. There is no rectovaginal fistula (Fig 473 1)

Ray examination by barium enemas show enormous dilatation of the sigmoid which almost completely fills the rectum

Operation (July 26 1922) —Dr V C David Circular anesthesia of the rectum by injection of  $\frac{1}{2}$  per cent novocain A small speculum is introduced into the rectum and the opening in the obstructing stricture is seen to be about 4 mm in diameter Beginning with a sharp pointed artery forceps the opening is gently dilated The smallest cervical dilator is now used and dilatation is increased until the opening is about 1 cm in diameter At this point the diaphragm is cut through in the direction of the long axis of the bowel and further dilatation

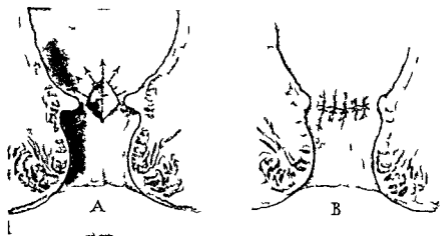


Fig 474 —Operative treatment of congenital rectal stricture by longitudinal incision and transverse suture

employed until an index finger can be introduced through the stricture into the bowel above which is filled with dry hard fecal masses A considerable amount of this is removed The mucosa is now mobilized by blunt scissor dissection so that the longitudinal stricture can be sutured transversely This assures a permanent widening of the strictured area which allows the passage of the index finger through it (Fig 474) It is the thought of the operator to perform the same operation on another segment if the first operation does not gain enough room

After history —Oil retention enemas were given each day as well as repeated retention enemas of small amounts of water

On the fourth day the child passed a large amount of fecal matter during the day and the large mass in the abdomen disappeared. The strictured area was examined from time to time and the index finger passed through it. A number of small fecal impactions were broken up and passed.

In August the patient developed diarrhea, took her food poorly, and on August 27<sup>d</sup> died.

*Autopsy by Dr H A Oberhelman*—The enormous enlargement of the sigmoid had disappeared while the bowel was hypertrophic and somewhat larger than normal. It in no way resembled the picture obtained by x ray before dilatation of the stricture where the sigmoid almost completely filled the abdomen. All of the fecal impaction had evacuated except one mass the size of a small peach which was in the lower sigmoid. The bowel completely enclosed the mass so that it appeared to obstruct the bowel though there was no dilatation of the bowel about it. The stricture had remained dilated to the point where the index finger could be passed through it. The mesosigmoid was greatly enlarged and the cecum could be moved to the extreme left portion of the abdomen. The heart showed a defect in the membranous septum, a Meckel's diverticulum was present.

Before discussing the pathogenesis of this congenital rectal stricture a short résumé of the histories of 3 other patients will be given which illustrate other phases of the same subject.

**Case II**—Case of megacolon in a boy four years old on the service of Dr Dean Lewis. The patient had had involuntary bowel movements since birth. Rectal examination revealed a rectal stricture as illustrated in Fig 473-2 which was associated not only with a circular narrowing of the mucosa but with some constriction of the muscularis as well. This stricture was about 3 cm from the anal orifice. It was dilated with cervical dilators up to the size No. 21 and then small incisions were made about the circumference of the stricture and further dilatation continued until the index finger could easily be passed by the narrowed portion of the bowel. A colostomy which

had been previously made was closed the patient passed normal voluntary bowel movements

**Case III**—A female child seven years of age on the service of the author at the Children's Memorial Hospital. The patient has had incontinence of feces since birth coming in attacks each week and occurring several times a week. These attacks occur without nausea or fever but are accompanied by some pain in the region of the umbilicus and the presence of a mass in the abdomen. These attacks clear up with the passage of an enormous bowel movement. While she was in the hospital she complained of considerable abdominal pain marked distention of the abdomen and incontinence of feces was present.

Examination revealed a pale child with marked distention of the whole abdomen especially around the umbilicus and associated with general muscular rigidity. No masses were palpable. Rectal examination revealed a sickle or valve like shaped diaphragm occluding the anterior two thirds of the rectum at about 3 cm from the anal orifice (Fig 473 3). Under ether anesthesia this membrane was divided longitudinally the constriction was well dilated the mucosa was mobilized around the longitudinal incision and a transverse suture of the division was made (principle of Mikulicz). The index finger could now be passed through the strictured region with ease. After the operation the patient had normal bowel movements and no involuntaries. Before discharge from the hospital the wound had healed and the rectum was well open.

Another case will be briefly reported having a stricture of the rectum consequent to a congenital deformity in which the same principle of operative treatment was utilized.

**Case IV**—Male infant two months old entered the author's service at the Cook County Hospital April 19 1922. The child was born with an imperforate anus and was operated upon twenty seven hours after birth when a longitudinal incision was made in the anal region and the rectal end of the bowel pulled down 2 inches and attached to the skin. The

baby has gained very little has infrequent bowel movements associated with distention of the abdomen. The anal opening is a small slit in the middle of a scar running from the perineum to the coccyx. It is about 5 mm in diameter.

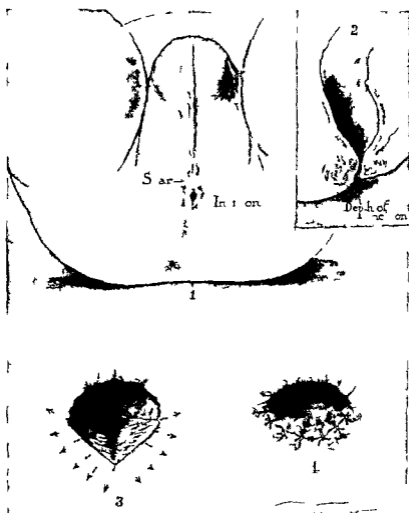


Fig 475—1-4 Structure following cauterization of stricture

Under ether anesthesia very small cervical dilators were passed but the stricture was fibrous and dilated with difficulty.

so a plastic operation was advised to definitely increase the size of the anal opening. Under ether anesthesia the anal opening was dilated with small cervical dilators until it was about 1 cm in diameter. As tearing of the margins began a longitudinal incision was made through the stricture on the posterior wall of the bowel down to and including some of the fibers of the sphincters. This incision was also extended posteriorly about  $\frac{3}{4}$  inch on to the skin. Dilatation was now carried out until it was possible to introduce the little finger through the constricted area. The mucosa above and skin below was so undermined and mobilized by blunt dissection until the longitudinal incision could be sutured transversely bringing the mucosa down to the skin (Fig 475). The child is now gaining and having regular bowel movements and a No. 11 cervical dilator is being passed every week to keep the stricture from reforming.

These 4 cases illustrate somewhat different phases of congenital malformations at the anal opening of the bowel. The different types of imperforate anus varying from complete lack of formation of the rectum to the incomplete formation of the rectum with fistulae leading from the rectal pouch to the bladder, urethra, vagina and perineum, are well known and well described in many text books of embryology, pathology or surgery. In contrast congenital strictures of the rectum with the external anal opening of the bowel apparently normal are rare and not only is scant mention made of them in text books but reported cases are very infrequently seen. Membranous or solid occlusions of the duodenum and esophagus are well known in the literature and are due to a persistence of the solid tube structure in them when the embryo is about 12.5 mm long (Tandler). The colon and rectum has no solid tube structure in its developmental stage and we must look to other anomalies of development for the explanation of the formation of congenital rectal strictures.

In the embryo the urinary tract and lower intestinal tract are at first one cavity formed by the closure of a groove of epiblast lying in front of the spine. This cavity or cloaca is divided into an anterior and posterior portion by the urogenital

membrane so that the anterior portion becomes urinary bladder and the posterior portion the rectum or mesenteron. The mesenteron descends toward the perineum where an infolding of epiblast called the proctodeum at the back of the embryo turns in to meet the descending mesenteron. The proctodeum forms the anus. Failure of the urogenital membrane to completely separate the rectum from the bladder or failure of the proctodeum to meet and unite with the mesenteron are responsible for the malformations occurring in this region. Bodenhamer in 1860 classified these malformations as follows:

1. Preternatural narrowing of anorectal region without complete occlusion.

2. Complete occlusion of anus by a simple membranous diaphragm or by an integument.

3. *Anus absent*. Rectum ends in a culdesac at a greater or less distance above its normal outlet without any connection whatever internally or externally.

4. Anus normal externally but ends on a culdesac and the rectum ends in a blind pouch at a greater or less distance above the ac being separated by a septum.

5. *Anus absent*. Rectum is prolonged in the form of a fistula to terminate by an abnormal anus at the glans penis, labia pedenta or at any point about the perineum or scrotum.

6. *Anus absent*. Rectum terminates in the bladder, urethra or vagina or into a cloaca in the perineum with the urethra and vagina.

7. Anus and rectum normal but the ureters, the vagina and uterus open into the rectal cavity.

8. Rectum entirely absent.

9. Rectum and colon absent. Bowel may open by an abnormal sinus in some unusual part of the body.

The rectal strictures described in the first 3 cases fall into the first of these classifications viz. preternatural narrowing of the anal region without complete occlusion. Practically all of these strictures occur about 3 cm. from the anal opening and are of various shapes. The congenital narrowing of the rectum may be valvular or tubular in form. The valvular stricture may

occupy the location of a Houston valve and be due to a simple hypertrophy of the Houston valve. More commonly they are membranous or diaphragmatic strictures and are due to an incomplete union between the anus and the rectum. They occur slightly above the mucocutaneous level and are about 3 cm above the anal orifice. In shape they resemble the iris of an optical instrument with a small central opening or may be like a hymen with rough ragged edges surrounding the central opening. The diaphragm may be semilunar or sickle shape as was seen in one of our cases. The valvular or diaphragmatic strictures just above the mucocutaneous level are usually only about 3 to 5 cm thick and consist of mucosa and submucosa. They are soft and pliable and the mucosa of the rectum below the diaphragm is normal and not leather like and indurated as it is in inflammatory strictures of the rectum.

Congenital strictures of the rectum which are cylindric or tubular have been reported where a tube of tissue with a small lumen connected the anus to the rectal pouch. These are due to failure of development of the proctodeum or of the descending pouch of rectum. They are usually 2 to 3 cm in length and have rigid walls which include all layers of the bowel. The cure can only be accomplished by gradual dilatation and this may be impossible of accomplishment and then a colostomy may be necessary.

Bouisson writing a thesis on malformations of the anus and rectum for a Chair of Clinical Surgery in the Medical School of Paris in 1851 has described 2 cases of congenital valvular stricture affecting Houston's valves which were preserved in the medical museum at Montpellier preposed by Professor Cabanil. He also has cited the case reported by Petit where an imperforate membranous septum occurred between the anus and rectum which was punctured on the day after the birth of the child and allowed the escape of a large amount of meconium. Bouisson also cites a case of congenital tubular stricture reported by Sculet in 1640 which was dilated successfully. He also gives credit to Benoit for being the first surgeon in France to recognize the congenital characteristics of these valvular or diaphragmatic

strictures That was in 1847 Bensort invented an instrument to clamp on to the edge of a diaphragmatic stricture which would destroy the tissues by reason of pressure necrosis Reynier in 1848 called attention to the occurrence of valvular or diaphragmatic strictures of the rectum in adults in whose history no etiologic factor for inflammatory stricture exists and in the examination of whom the findings are those which have been described as characteristic of congenital stricture without inflammatory changes in the mucosa He reports the histories of 7 patients varying in age from fifteen to thirty two years and refers to another patient of forty years whose stricture was described by Bouisson In Reynier's cases 4 had strictures 2 to 3 cm above the anus one was 8 cm above the anus one was in the middle portion of the rectum and the last one was at the junction of the middle and superior portion of the anus The shape of the strictures were optical instrument types of diaphragm or of the valvular type Due to the fact that symptoms of the constipation or actual obstruction occurred so late after infancy Reynier assumes that the soft pliable nature of the valvular constrictions was lost in later years and the constrictions became more fibrous His cases were treated by multiple incisions of the obstructing membrane

Reclus one of the few modern authors writing on the subject who has interested himself in the pathology and pathogenesis of rectal strictures has described 6 cases of rectal stricture occurring in adults from thirty to fifty two years of age which he insists were of congenital origin His basis for such a view was the absence of a history of an inflammatory process in the rectum and the diaphragmatic form of stricture occurring about 3 cm from the anal orifice In 3 of these patients he found non infected dry fistulae with a lining of scar tissue reaching from below the anal opening to a point just below the stricture Microscopic study showed no inflammatory exudate about these fistulae and the pathologist Lebulle expressed his opinion that the fistulae were congenital in origin and resembled in structure the congenital cysts found in the kidney or liver

Reclus believes that a diaphragmatic stricture about 3 cm

from the anal opening especially when accompanied by a dry fistula is a congenital stricture There are certain features about such strictures in adults that are hard to explain on the basis of a congenital malformation I have seen diaphragmatic strictures in the rectum which I am sure were caused by trauma and inflammation A toughening and leather like quality of the mucosa below the stricture as described by Reclus in one of his cases results from inflammation Dry or scar tissue lines fistulæ have been observed numerous times leading from the scarred base of a healed ulcer Lastly it is hard to understand why the patients should have symptoms coming on so late in life if the stricture had existed from infancy These objections however are not wholly incompatible with the theory of the congenital origin of some strictures which are first recognized in adult life

In conclusion we believe especial emphasis should be placed on the development of a megacolon very closely resembling the type described by Hirschsprung in 3 of these cases developing in childhood While it is probably true that congenital rectal strictures are not responsible for any considerable proportion of infantile megacolon it is essential in the diagnosis to rule out mechanical factors such as these strictures represent

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## CLINIC OF DR PHILIP H KREUSCHER

MERCY HOSPITAL

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### UNUSUAL INJURIES ABOUT THE KNEE JOINT

Three Cases, Each Presenting a Separate and Distinct Type of Injury to the Knee joint Treatment in Each Case

MURPHY said "An operation upon the knee joint is one of the most difficult of all major operations

The knee joint because it is a weight bearing joint because it has a complicated mechanism and because of the many structures which are subject to traumatic lacerations and ruptures is prone to injuries which are entirely incapacitating and very often difficult of repair The internal ligaments the semi lunar cartilages the synovial and fibrous capsules and the patella with its various attachments one or several of these may be torn fractured or deranged in such a complicated manner that one often wonders if ever the joint will function again To illustrate this fact I wish to present 3 cases of knee joint injuries of a rarer type no two alike but each one a separate and distinct study in the tissues involved and in the method of reconstruction In each of these cases the incapacity was chiefly one of being unable to extend the leg on the thigh In each there was no external evidence of a severe trauma except a slight bruising and discoloration of the skin and the distorted contour of the knee joint The skin was not broken or punctured in any one of these cases In one the patella was dislocated downward in the other it was dislocated upward and in the third it was dislocated far outward from its usual position

The first case which I wish to bring to your attention is that of a young man twenty eight years of age who while exercising in the gymnasium suddenly slipped throwing his full

weight upon his right knee and striking upon the sharp edge of a metal bar. The pain thus occasioned was excruciating; the patient fell over and was carried from the gymnasium floor. The leg was straightened and very soon the knee joint began to swell greatly. He was able to flex his leg but entirely unable to make any effort at extension. He was brought to Mercy Hospital within six hours after the accident.

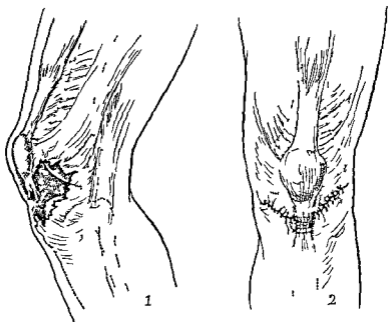


Fig. 476—Case I. 1 Shows the appearance of the knee joint after the accident. 2 A photograph of the knee joint after the operation.

Examination with the x ray revealed that there were no injuries of any of the bony parts about the knee. Further physical examination showed that the knee joint was entirely filled with a thin fluid, possibly blood. Careful aspiration of this fluid was made and it proved to be liquid blood. After this fluid had been withdrawn from the knee joint the diagnosis could easily be made. With the examining finger upon the skin just below the patella one could introduce the finger deep into the

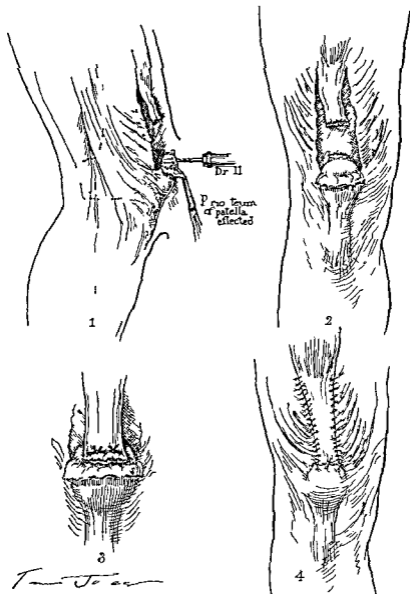
joint cavity and outline the semilunar cartilages which fortunately had not been displaced or fractured

Following the teaching of Murphy that it is unwise and unsafe to perform an open operation upon a joint immediately after accident, I waited for one week until nature had time to throw a cofferdaming about the injured parts and until there was no longer any active bleeding into the knee joint. I believe in this way we can very frequently avoid infections where otherwise a fresh blood clot and open lacerated tissues would make splendid culture media for the bacteria which we know enter every open incision during operation

At the end of one week I made a semilunar incision carrying it an inch lower than the line of rupture in the capsule. Obviously this was done so that our line of suture in the capsule and the skin incision should not lie in the same plane. Upon dissecting the skin back I found on examination nothing intervening between the skin and the joint cavity. After considerable difficulty I found numerous shreds of tissue both long and short some of them attached to the patella and some just attached to the tubercle of the tibia. This was the remnant of the patella tendon (Fig 476 1 Case I). The fibrous capsule was torn jaggedly on either side of the patellar tendon extending inward about 2 inches and outward  $1\frac{3}{4}$  inches. The repair of this proved difficult because I was obliged to gather together the shreds in an effort to make a presentable and sufficiently strong tendon to function in the case of a very large and muscular individual. After the capsule had been repaired and the shreds of tendon brought together the knee joint was closed without drainage and placed in a straight two thirds posterior plaster splint with a Buck's extension of about 10 pounds (Fig 476 2 Case I).

The wound healed by primary union and after six weeks the patient was permitted to make an effort at flexion. On the last examination eight months after operation the patient could fully extend the leg without the slightest difficulty.

The second case which I present to you is one of a rather similar accident but in this instance the patella is displaced downward instead of upward. A young man about thirty two



Fg 477—Ca II 1 St w g th pt d q d p t so t don  
 1 a lat l w The pe t m ha be eff ct d ba kw d nd tl  
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years of age was struck by the bumper of an automobile just at the insertion of the quadriceps extensor tendon into the patella. An x ray picture was made and no bone injury was shown so a splint was applied and the patient permitted to go about for a period of two months. When the splint was removed the patient had no pain and no apparent deformity but he was entirely unable to extend the leg. Examination at that time revealed as in the first case that there seemed nothing to intervene between the skin just above the patella and the femur. Upon closer examination the stump of the quadriceps extensor tendon could be located  $1\frac{1}{2}$  inches above the upper end of the patella. It being about ten weeks after the accident I advised operation at once.

The incision in this instance was a transverse one so that we would have plenty of room to make a good repair or rather the re attachment of the tendon to the patella. After making an incision through the skin we found that we were immediately in the suprapatellar pouch of the knee joint (Fig 477 1 Case II). The joint contained a very small quantity of a clear fluid and of course we were most careful not to introduce blood or even sponges into the joint cavity. Our next problem was to expose the stump of the tendon which was not so difficult but to bring it down to meet the patella proved to be quite a difficult task. I grasped the center of the tendon stump with a heavy vulsellum and attempted to draw it down to meet the patella but found that I must in some way elongate it at least  $1\frac{1}{2}$  inches. To accomplish this elongation I made two lateral incisions parallel and just at the side of the rectus femoris tendon (Fig 477 2 Case II). These incisions extended upward a distance of about  $2\frac{1}{2}$  inches on the inner side and about 3 inches on the outer side dividing the attachment of the vastus lateralis and vastus medialis. In this way I was able to bring the stump of the tendon down to meet the patella. The tendons of the lateral muscles were resutured in their new position. To make a nice attachment to the patella I trimmed the stump down so that it could easily be handled with sutures. The patella was then prepared for the attachment by making an incision through

its periosteum and deflecting it backward. Then I drilled three holes through the patella from before backward (Fig 477 1 Case II) and brought the tendon down suturing it with kangaroo tendon by several mattress-sutures through openings I had made. The reflected periosteum was then brought back and united to the tendon. This gave us two definite attachments to the patella, one by means of sutures directly on to the bone and the other by suturing the periosteum to the quadriceps (Fig 477 3 Case II). By this procedure one had no roughened surface to which the skin might become adherent, and we had not in any way roughened the surface on the joint aspect of the patella. The wound was closed without drainage. A posterior splint similar to that used in the first case was applied, and after seven weeks the patient was permitted to make an active motion of the knee. Examination today shows that the patient can flex his leg acutely on the thigh and can extend it completely with very considerable strength. The knee joint is entirely stable.

The third case presents a new variety of injury involving tissues not affected in the first 2 cases mentioned. A woman about forty, weighing about 215 pounds, was knocked down by an automobile having been struck on the outer side of the right leg just above the knee joint. Examination of this extremity revealed that there had been a displacement of the patella outward upon the external aspect of the knee joint with the leg in a flexed position. This patient, very much as the second one, was treated in a plaster splint for a number of months in the hope that the tissues would again reattach themselves and permit of normal function.

When she came to the hospital one year after the accident she walked with a cane with the right leg in a knock-kneed position, distinctly flexed, and was unable to extend or further flex the extremity. The examination showed that with great difficulty the leg might have been straightened by force if it had not been for the fact that the patella with its tendinous attachments had become firmly attached on the outer side of the knee and of course would not stretch sufficiently to allow her to

straighten the leg I realized that in such an extensive dislocation the internal portion of the fibrous capsule of the knee and also the vastus medialis attachment to the capsule and tendon must have been severed. To restore these tissues then it was necessary to make an extensive exposure of the anterior

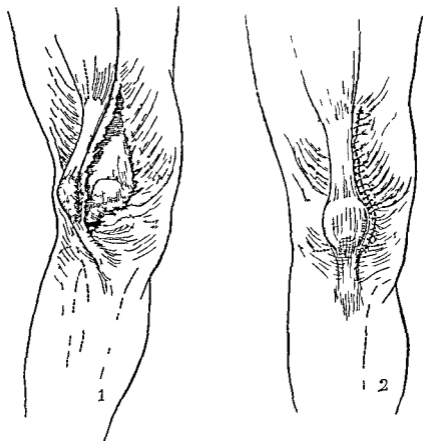


Fig 418—Case III 1 An extensive rupture of the fibrous capsule and the tendinous portion of the vastus medialis. The patella is displaced far out on the flexed knee joint 2 Completed operation

portion of the knee joint. This I accomplished beautifully by using a modification of the incision of Trethowen. After exposing the underlying tissues I found that I had been correct in my deductions that the fibers of the vastus medialis had been severed and that the fibrous capsule had been torn and stretched to such an extent as to permit the patella to lie

in this abnormal position (Fig 478 1 Case III) The repair of these tissues was not as difficult as we had anticipated but the detachment of the patella and its tendons in the lateral position where it had become fixed was difficult beyond our expectations I found that it was necessary to dissect under the tendon and on the outer side of the patella in fact to disconnect a considerable amount of fibrous tissue which had formed before I could again bring the patella into its normal position between the condyles of the femur Finally after having accomplished this I reconstructed the capsule on the inner side and also the fibers of the vastus medialis The skin was closed with a small rubber tube drainage I felt that drainage was necessary because of the very extensive dissection and because of the capillary oozing which naturally must take place after such an operation

This patient has a straight extremity and has a good functioning knee cap which lies in a normal position

In reviewing the literature on this subject we find very little which gives one an accurate comprehensive knowledge of the processes of repair used by the various operators There is no one technic which will apply to all cases one must meet the emergency as it arises Those tissues which have been torn or detached must be reunited Those tissues which have been so greatly destroyed as not to permit of reunion must be replaced by some similar material from other parts of the body If there are not sufficient fibers left of the patellar tendon a portion of the fascia lata may be used as a substitute If the fibrous capsule is so greatly destroyed that it is impossible of repair a portion of the same tissue may be transplanted into that portion of the knee joint

In conclusion I wish again to call attention to the fact that all the severe injuries occurred without great injury to the skin that in none of these was there a fracture or injury to the joint that the repair in each case was possible by simply using our knowledge of the normal anatomic relations of the various tissues and placing them in the position in which they could best function

## CLINIC OF DR HUGH MACKECHNIE

### POSTGRADUATE HOSPITAL

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#### SPASTIC COLON

Patient Showing Clinically Spastic Colitis, a Kinked, Adherent Appendix, and Constipation, no Intestinal Adhesions or Neoplasm Appendix Removed, Constipation Corrected, and Spasticity Improved

Miss N K complains of pain in upper abdomen on each side sometimes through to the back usually coming on from one to two hours after eating She cannot eat certain foods such as fried meats and vegetables Much gas is present after meals which is very distressing and lasts from one to two hours Bowels are quite constipated requiring two or three pills daily to evacuate and then very unsatisfactorily She has had no severe attacks or any signs of peritonitis She was operated on for a cystic ovary two years ago but otherwise has been rather healthful

On examination temperature is 98.6 F and pulse 80 Patient is quite fat with thick walled rounded abdomen The right abdomen is tense with marked tenderness at McBurney's point There are tympanitic and dull areas the latter predominating x Ray examination shows some spasticity in the terminal ileum with a loaded distended cecum ascending and part of the transverse colon The latter half of the transverse colon splenic flexure and descending colon are quite spastic The appendix is bound down and irregularly filled with barium

Urine examination shows amber color acid reaction specific gravity 1020 no albumin sugar or casts

The diagnosis is chronic appendicitis with spastic colitis Based on past experience in these cases we will operate and

remove the appendix at the same time bearing in mind the possibility of complicating conditions being found

This case is much like many others which are continually coming up for examination and some for operation. I believe it is a demonstration of the condition in many of our chronic constipation sufferers who appear to be doomed to go through life as semi invalids after all the usual exercises dietary regulations and medicines have failed

**Operation**—I make a midline incision to remove this old scar and because I want to be able to examine the whole colon on account of its spastic appearance. Between the omentum and the abdominal wall you note slight cobweb adhesions which are readily separated. The cecum is brought into the wound with some difficulty because of the adherent appendix. The appendix is quite distended in its proximal half then constricted and very small in its distal half. I remove it by the usual purse string figure of 8 method placing one loop around the mesial artery and the other by suture around the base of the appendix. This eliminates the need of a tump ligature for hemorrhage. I think that the ligature and then the purse string suture are dangerous because there lies between them an infected area which is always a potential abscess. Fortunately nature is strong and overcomes the infection in many cases. Over the purse string I tie the cut mesocolon to cover the raw surface and to protect the stump. I note here a Meckel's diverticulum about 14 inches from the cecum which I also remove with purse string and suture as in the case of the appendix.

I now pass my hand into the abdomen to ascertain if there are any tumors or adhesions which might produce the narrowing of the lumen of the colon. I find none. The abdomen is closed with catgut and dermal sutures.

**Note**—On the fifth day after operation patient had a normal bowel movement and on the seventeenth day she reported normal movements twice daily.

I want to give you the history and show you the x ray plates of 2 other cases which resemble the above in most details.

The first patient Mrs W H was admitted to the hospital

June 3 1922 complaining of severe constipation which required large doses of purgatives daily to produce a stool She had pain in the right iliac fossa greatly aggravated when she became constipated headaches of a toxic type with coated dry tongue feverishness etc Appetite was always good

Temperature was 98.6° F pulse 76 and blood pressure 130/85 Patient is a well nourished woman with full rounded abdomen with areas of dulness and tympany She has notice-



Fig. 419 —Roentgenogram showing marked spasticity in descending colon with some in the proximal half of the transverse

able tenderness in the right iliac fossa She had one child five years ago at which time the perineum was lacerated and repaired She has had little inconvenience from that condition except with the bladder

Skagraphic examination shows some stasis in the terminal ileum colon irregularly filled transverse colon shows marked prolapse there is spasticity of the descending colon with only a slight amount of barium therein and a short tender retrocecal appendix

The appendix was removed in this case and the abdomen explored for any further evidence of pathology which was not found. A slight perineorrhaphy was performed.

The skiagraphic plates taken six months after the operation which I show you indicate a decreased spasticity both in intensity and extent. The fluoroscopic report is more favorable than the evidence on the plates. It says conclusions in this case are that while there is less spasticity and that the motility of the



Fig. 480—Roentgenogram showing decreased spasticity of descending colon than before of spasticity. The meal half finished. The basal spasticity still remains rapidly.

meal through the colon is more normal than at first examination there is still some spasticity especially in the lower portion of the descending colon and sigmoid. The motility of the meal is slightly delayed but in general a marked improvement is shown. Her bowels move regularly. She is cured of her headaches and dizzy attacks also of the backache and toxemia.

The second patient Miss F. S. complained of very severe constipation which required large doses of purgatives daily. She had gone through the list and was growing discouraged.

This constipation came on rather abruptly some two months before almost coincidently with a slight attack of pain in the right side. She had neither nausea nor vomiting fever or other signs of serious trouble. She showed a dry coated tongue thirst feverish feeling but at no time had she fever. She was losing her appetite had some belching after meals and was beginning to have toxic headaches etc



Fig 481 —Roentgenogram showing spasticity of the descending and sigmoid colon with marked retention of the barium in the transverse colon

On examination we found a young woman twenty three years old very well nourished weighing 169 pound with a normal temperature and pulse. Tongue was coated white and very dry. Blood examination showed 8600 white cells 4 500 000 red cells and 87 per cent hemoglobin. Urinalysis showed specific gravity 1018 amber color acid reaction no albumin sugar or casts a few epithelial cells.

On first examination there was much dulness on percussion increased rigidity of the right rectus and moderate tenderness over McBurney's point. As these conditions were

What constitutes spasticity? It seems to me that we should define spasticity briefly as a condition of the bowel in which we find both the muscular tissues so affected that some contraction and fixation have taken place producing a decrease in normal muscular activity. This preumes that we know what a normal appearance and the normal movements of the bowel are. Of course we know that this like many other of our measurements is relative and that all examinations should be made by the same man under similar conditions to be approximately correct.

It is not as yet understood why we have this spasticity. It has been suggested that it comes on as a secondary infection following an infection in the appendix that this infection locates either in the mucosa (bringing on a muscular reflex) or in the muscularis (producing a low grade myositis with its consequent muscle splinting) as is found in myositis in the skeletal muscles.

The small amount of inflammatory reaction together with the lack of evidence of early ulceration in these case speak against such probability and yet we should not dismiss it too lightly in view of our knowledge of myositis and neuritis in other parts which are evidently due to infections and which are just as quickly relieved at least clinically as are these case by the removal of the primary focus.

Keith made a study of a number of spastic colons that Lane removed. He found patches of fibrosis in the muscular liver with some decrease of muscle tissue. He also found areas with a slight amount of round celled infiltration but none of these coincided with the areas of spasticity. He felt that this infiltration must not be considered as the causative factor of spasticity but rather a sequence of it. Furthermore one would scarcely look for the marked immediate clinical relief by the removal of a focus of infection in cases where there was a secondary focus.

Keith puts forth the theory that the spasticity is the result of a stimulation of a specialized neuromuscular type of tissue which is to be found in the areas so prone to spasticity. Following some work on the neuromuscular mechanism of the heart

in which he claims he found a node that seemed to control cardiac movements he began a search for a type of tissue that might be doing a similar work for the complicated mechanism around the ileocecal region. He found such a tissue much resembling Auerbach's plexus. This tissue is also present in the pylorus in the terminal ileum and in the descending colon. These are the parts most frequently found spastic. He believes that this tissue keeps the bowel in its normal tonic state but that under irritation or stimulation it becomes hypertonic and a spasticity is produced. It is possible that this tissue may be the center through which the impulse derives its origin and that the impulse is carried over to other similar tissue at distant points to produce the same hypertonicity that is produced through it self. This is rather acceptable because in most of these chronic appendix cases there is a spasticity in the colon and also at the pylorus. It is quite probable that this same tissue is the factor producing a pyloric spasm and antiperistalsis resulting in nausea and vomiting at the onset of acute appendicitis.

I think we must add to this auto stimulation and reaction of Keith a still further point viz a reflex through the splanchnic system. An irritation in the appendix and possibly of the ileocecal collar of Auerbach's tissue sends an impulse through the superior mesenteric branches to the celiac plexus and from there an impulse is sent to the Auerbach tissue located in the descending colon and the pylorus. The resulting stimulus produces a hypertonicity of these parts and the contraction is produced. The apparent elective action in these reactions is readily explained by the similarity in type of tissue in the areas in which spasticity is found.

Having present such a spasticity of what importance do we find it? A reference to the patients seen in daily practice suffering from constipation with toxic headaches etc is our answer. A study of the work of Lane who has done more than any other shows the number and type of conditions that appear to arise from the toxemia incident thereto. If we accept the work of Lane and his associates we are at once struck with its importance. Mutch has shown the various types of bacteria

present with the fermentation products at different points in the intestinal canal

How can this all be relieved? To say that removal of the appendix is sufficient will bring disappointment many times I think that it will be very gratifying in many cases It may be that other conditions may produce the syndrome It may be that pyloric ulcer with pain may produce it or cholecystitis or pyosalpinx or other inflammatory process Whatever effect these may have as causative factors I do not know but in several cases it has seemed that the removal of the chronically inflamed or deformed or irritable appendix was a factor The skiagraphic pictures shown are only partial proof of the results Clinically all of these cases have shown marked improvement passing from the stage of requiring 2 to 5 pills a day to that requiring none to produce one or two natural movements daily

## CLINIC OF DR. EMIL G. BECK

NORTH CHICAGO HOSPITAL

### TUBERCULOUS LYMPHADENITIS ITS SIGNIFICANCE AND SURGICAL TREATMENT

Discussion of Pathology Diagnosis, and Treatment of Tuberculous Lymphadenitis    Presentation of 4 Cases

IN reviewing the development and changes in the treatment of tuberculous glands in the neck one is impressed by the fact that twenty years ago we witnessed in our surgical clinics so many surgical operations for the removal of tuberculous glands whereas at the present time we see such procedures only occasionally.

I remember that in my school days we witnessed in almost every surgical clinic extensive resections of the glands with exposure of large blood vessels the operation sometimes lasting two to three hours. Recurrence of the disease was not very infrequent and the scars which remained after these extensive operations were rather common and very unsightly. Why do we not see so many at the present time? Has surgery failed or is the disease less prevalent? It is quite possible that the removal of tonsils in early childhood which is now practised so extensively is one of the preventive measures against enlarged glands in the neck.

The gradual and chronic enlargement of glands is not to be regarded as a disease *per se* it is a secondary infection the primary focus of which is usually in the mucous membrane of the upper respiratory tract the tonsils the teeth and sometimes the accessory sinuses of the nose. The enlargement of the glands is not always of tuberculous origin and when the infection is acute the glands are only temporarily enlarged.

and recede as soon as the primary acute affection has subsided. In the chronic and persistent infections such as tuberculosis the glands do not return to normal size but have a tendency to increase in size and in number. In time they may become caseous and finally suppurate.

The suppuration may cause an abscess within the gland which works to the surface and may rupture spontaneously or may be incised by the surgeon and drained. In either case a spontaneous closure may take place at times it may require medical or surgical intervention.

We have all noticed that some children around the age of three to six years sometimes several members of the same family have a slight enlargement of the glands back of the sternocleidomastoid. These glands may or may not be of tuberculous origin. We have seen them gradually diminish until at the age of ten or twelve years they have entirely disappeared without having reached any abnormal size or having progressed to the stage of suppuration. What has become of these glands? The infectious process has receded and the glands have returned to their normal anatomic size. The progress of the disease or the return to normal seems to depend on one factor namely *immunity*.

If an individual is able to produce sufficient antibodies to overbalance the disease the glands will disappear spontaneously providing they have not reached the stage of suppuration. We may regard the infected gland as a factor in immunization—a sort of a laboratory for the formation of immune bodies. This explains to a certain degree why so many people who have lived through the acute stage of infection remain free from symptoms after a sufficient time has elapsed. This may be illustrated in cases of spontaneous recovery from pulmonary tuberculosis. Evidence of the disease having existed may easily be demonstrated in stereoroentgenograms of the hilus of the lung. We find in almost every individual over twenty five years of age some evidence of a glandular enlargement—shadows in the hilus of the lung and in many instances we find alveolar deposits of calcium salts. The permanent scar tissue

and the deposit of the calcium salts give a definite shadow. This does not mean that there is any disease actively operating in the glands of the hilus. It simply means that the disease had previously existed from which the patient has recovered.

Some ten years ago I convinced myself of this fact. I selected 12 healthy nurses in our Training School and took stereo roentgenograms of their chests. In not a single case did I find the hilus free from glands. The deposits of calcium in the glands signify that the particular individual possesses considerable immunity against tuberculosis.



Fig 483—Stereoscopic roentgenogram. Calcified gland in the neck not operated upon.

I will demonstrate here by a graphic illustration to what degree this calcification may go. In Fig 483 a stereoroentgenogram I show a bilateral enlargement of the glands of the neck in a lady of thirty five years. You will note a group of glands on either side so well defined and so distinct as to resemble a chain of beads, some being as large as a small sized walnut. She presented herself for surgical operation some ten years ago. After stereoroentgenograms were taken showing the amount of calcification I advised against operation if she did not mind the deformity in her neck, because her health was unimpaired.

I have observed this case for the past ten years and up to the present time there has been no change in her condition either in the glands of the neck or the lung. This leads me to say a few words on immunity.

**Immunity**—Every individual is born with a certain degree of immunity against disease. The degree of this natural immunity varies not only in different individuals but in different stages of their lives. If there were no immunity whatever at birth the child would be likely to succumb from the inhalations of its first breath of air for it contains various types of pathologic micro organisms which would find a very suitable soil in an unprotected individual. Besides this natural immunity each individual gradually acquires an additional immunity during life. If for instance a person is stricken with typhoid fever and recovers he will possess an immunity for this disease for a long time. This acquired immunity differs with the different infections and gradually diminishes and in some diseases such as smallpox and mumps is permanent while in other diseases such as measles scarlet fever etc. the immunity lasts but a short period.

The body may also be immunized artificially by vaccines or serums a method well known to all of us.

We have thus three types of immunization

- (a) Natural
- (b) Acquired
- (c) Artificial

Tuberculosis has a great tendency to immunization of the body because the disease is so prevalent. If it were not for this tendency all once affected with tuberculosis would die from the disease. The human race would soon be extinct for we know that almost every individual has once in his lifetime been afflicted with tuberculosis. He may have been so slightly affected and the process have been so gradual that the individual was not sufficiently ill and did not even know that he had the disease nevertheless these repeated small doses of infection produced a pronounced immunization without the patient's knowledge.

**Pathology**—Tuberculous gland are not confined to the neck

but they are so prominent in that region that our attention is called to them by the patient himself. They are more frequent in the hilus of the lung than any other part in the body. They are present in the mediastinum in the mesentery of the intestines in the groin and in the axillæ.

The infection travels through the lymphatic channels from gland to gland a proliferating process being a factor in producing the enlargement. Giant cell formation and tubercles gradually form and the interior of the gland may go on to caseation. The capsule of the gland becomes infiltrated and thickened and finally fibrous. If suppuration takes place the gland will become adherent to the overlying skin slight reddening of the skin will appear softening and fluctuation will take place and the abscess may rupture spontaneously. The contents may contain living tubercle bacilli and other micro-organisms at times the pus is sterile and is regarded as a cold abscess. Living tubercle bacilli are present in the walls of the lining of the capsule.

**Differential Diagnosis**—Enlarged glands in the neck are by no means always of tuberculous origin. Temporary enlargement is not unusual in simple cases of tonsillitis. The adenitis which very often follows measles scarlet fever etc. usually recedes within thirty days after cessation of the symptoms of the disease. When glands in the neck develop gradually and slowly and keep on increasing or remaining stationary we may suspect that they are of the tuberculous type although there are other diseases that will produce the stationary enlargement.

We eliminate the following possibilities

(a) *Multiple Sarcoma*—This condition is not usually confined to the neck. One will find the enlarged gland all over the body especially in the lungs. The patient's general condition will help in differentiating it from the tuberculous gland of the neck. Radiographs of the chest will demonstrate multiple sarcomata as round well-defined bodies scattered all through the lung and not in the hilus like tuberculosis.

(b) *The Non tuberculous Infection or Gland Due to the Infection of the Nose Throat or Teeth*—The non tuberculous glands in the neck resemble very much the tuberculous type and at

times the diagnosis is almost impossible except with the aid of microscopic examination

(c) *Hodgkin's Disease*—This affection has in its incipency very often been diagnosed as tuberculosis but when progressive it is seldom taken for tuberculous glands. The enlargement is not confined to the neck as a rule. The armpits and the lungs as well as the spleen are very often the seat of very large tumors. Hodgkin's disease is a progressive disease always terminating fatally within three to five years. The tumors are very much harder never undergoing suppuration or caseation unlike the tuberculous glands. The tumors are not as a rule separated but adherent to one another something like a large fibroid of the uterus. A microscopic examination of the tissue removed from a case of Hodgkin's disease markedly differs from that of a tuberculous gland and a diphtheroid bacillus may be cultured from Hodgkin's disease.

(d) Small cysts (cystic) or small multiple lipomata are not likely to be mistaken for tuberculous gland because their consistency and location differ so much from the tuberculous type of lymph glands.

**Treatment**—The present day treatment differs very much from that of the past. Surgeons do not decide as readily upon the removal of the tuberculous glands of the neck as they did twenty years ago. Only three times during the past ten years have I resorted to their resection in a large series of cases. The course of procedure depends largely upon the stage of the disease and its extent.

(a) Enlarged glands in the neck which are of recent origin where the infection has been of an acute character should for a time be left alone as they will as a rule recede in a very short time.

(b) If the enlargements persist or when the glands keep on growing larger treat the focus from which the infection came. The teeth should be examined by a competent dentist with the aid of radiographic pictures. The nose and throat and accessory sinuses should be examined by a rhinologist. The tonsils and any disease in any of them should be eliminated prior to any

treatment upon the glands themselves. We should wait long enough and watch the decrease of the glands. If they do not decrease then it is best to resort to deep therapy by means of  $x$  ray or radium and this should be done by a competent roentgenologist and not in a haphazard way.

Tonsillectomy especially is indicated when the tonsils appear abnormal. In many instances the glands in the neck have disappeared after the tonsils were removed and no other treatment was supplemented.



Fig. 484.—Keloid scars subsequent to operations for tuberculous gland.

(c) Should the glands undergo caseation or suppuration then it is best to make a very small incision—a stab wound—into the gland under local anesthesia, eliminate as much as possible of the cheesy mass or the pus and inject the cavity with a 10 per cent *bismuth paste*. If the gland does not reduce in size perceptibly it may be necessary to resort to its resection. In such a case the wound if not too large should not be sutured. Instead of closing the cavity by suturing as we did in previous times the cavity should be left open and packed with gauze for twenty-four hours. Upon removing the gauze the edges of the

wound should be firmly approximated not by sutures but by adhesive plaster. By such procedure the scar is likely to be less prominent and there will be less tendency to keloid formation than by suturing.

(d) In cases where the glands have already ruptured or have been incised and drained and sinuses persist the best treatment is the *injection of bismuth paste* into the sinuses. Most of them will close up without surgical intervention. The scars after the sinuses have healed are surprisingly insignificant.



Fig. 485—Tuberculous gland (fluorinated g.)



Fig. 486—Complete disappearance of gland after puncture and injection of bismuth paste.

This method is so well known that it is not necessary in this paragraph to describe it in detail. I will therefore refer only to the recent articles written on this method and especially the one in the text book *Surgical Diagnosis* by Ochsner.

(e) Cases which have already been operated upon and bear large unsightly scars, sometimes of keloid character with contractures, can be successfully treated by a plastic operation (Fig. 484). A resection of the scar tissue and the coaptation of the wound edges by subcutaneous silk worm gut suture—first step. The skin edges should then be brought together with very fine horsehair sutures, but these should include

very border of the skin edges and not include the entire thickness of the skin merely enough material should be caught to keep the edges together sufficiently long to produce adhesion

For illustration of the various procedures I cite one of each variety

**Glands Already Undergone Closed Suppuration —Case I —**  
A lady of twenty six years developed glands in the right side of the neck in the year 1914 I saw her during the first of 1917 (Fig 485) These glands had at that time evidently undergone a cheesy degeneration and there was some fluctuation in one of



Fig 487 —Tuberculous glands requiring resect on

them Instead of extirpating these glands at once a very small incision under local anesthesia was made in the center of each gland The pus was allowed to escape and the cavity was then injected with 10 per cent bismuth paste This was supplemented with x ray treatments and within six months there was practically no evidence of any glands and just a minute scar which did not even require suturing in the region of the incisions (Fig 486)

**Case in Which Resection Was Necessary —Case II —** Mrs. F. H. aged thirty-one presented herself in October 1921 with a tuberculous gland in her neck as shown in Fig 487 There

was a slight softening in the center. A small incision was made but very little pus escaped. The small cavity was injected with bismuth paste but the reduction in the size of the gland was not satisfactory. There must have been a great deal of solidified cheesy mass and some of the gland substance left within the capsule. The patient was unwilling to undergo protracted treatment and it was decided in January 1922 to resect the gland. This was done but instead of suturing the edges of the wound the cavity which was left from the removal of the gland was



Fig 488—Left side of neck showing tuberculous gland.



Fig 489—Patient after treatment with subcutaneous injection and application of fish oil.

packed with gauze and the same was removed twenty-four hours later. A keloid scar however did form which was treated surgically one year later.

**Treatment of Postoperative Scar and Contracture—Case III**—Mrs. J. F. at the age of twenty-five developed tuberculous glands on both sides of the neck. Quite an extensive growth on the left. She was operated by her physician three times in a period of two years. Each time a recurrence of the gland took place. These operations left very heavy keloid scars in the left neck with contracture of the head as shown in Fig

468 After two years of general treatment which included resection of ribs for tuberculosis her general health improved and we decided on a plastic for the scar. She was operated in 1913. It is always necessary to excise the scar completely beyond the border of infiltration so that perfectly normal skin shall constitute the edges of skin which are to be united. Instead of putting in a running suture we use a subcutaneous silkworm gut inserting the suture rather far away from the

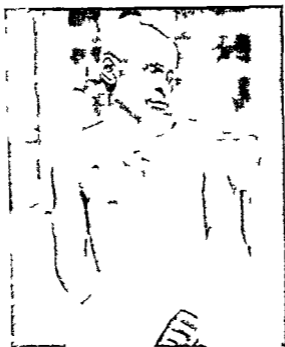


Fig 490 —Tuberculous glands in the neck and the sternum

edges so that the skin proper is only approximated. The skin edges proper are then united by interrupted horsehair sutures. These sutures should not penetrate the entire thickness of the skin, only the most superficial layer. The stitches must be placed very closely together. These sutures will hold the skin edges in apposition for adhesion and drop out in two to three days leaving practically no scar. This is illustrated in Fig 489. After ten years there is not much more than a linear scar left and the neck is freely movable.

**Case in Which Suppuration with Sinuses Had Persisted —**

*Case IV* — A colored man admitted in 1913 into the Municipal Tuberculosis Sanitarium had for years suppurating glands in the region of the neck and chest (Fig 490). Some of these sinuses were the result of tuberculous osteomyelitis of the sternum and ribs others from diseased glands in the supraclavicular region. The case was treated by bismuth injections alone and after two months treatment the sinuses closed and have remained so.

In most cases of this kind where the sinuses originate in bony structures it is necessary to remove the diseased bone before we may expect any results from the bismuth treatment. In this case however the sinuses closed without surgical intervention.

## CLINIC OF DR CAREY CULBERTSON

COOK COUNTY HOSPITAL

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### VAGINAL HYSTERECTOMY COMBINED WITH COLPO VESICORRHAPHY AND COLPOPERINEORRHAPHY

History of Present Case    Diagnosis    Fibroid Growths in the Wall of the Uterus and Possibly a Submucous, Pedunculated One    Conditions to Be Differentiated    Operation    The Schuchardt Incision in Vaginal Section    Colpovesicorrhaphy and Colpoperineorrhaphy    Advantages of Method Employed

IN a previous clinic<sup>1</sup> extirpation of the myomatous uterus by abdominal section has been described together with remarks on differential diagnosis and ovarian conservation. At the present time I desire to present a case wherein conditions are suitable for hysterectomy by the vaginal route.

The patient is a widow thirty four years of age waitress by occupation who enters the hospital complaining of the following symptoms:

Prior to February, 1922 her menstrual periods which began at thirteen years of age were regular every twenty eight days and of seven to eight days duration. She flowed freely with moderate dysmenorrhea but at the time stated suffered a profuse flow characterized by clots and cramping pains which lasted for ten days. One week after the cessation of this discharge a similar hemorrhage occurred. There had been no preceding amenorrhea and the patient states that pregnancy was out of the question. Since that time she has been subject to intermittent bleeding from the vagina with clots and pain and this has become more profuse and continuous during the

past three months In other words during the past eleven months there have been no regular menstrual periods but ir regular intermittent bleeding

In addition the patient complains of constipation and frequency of urination Leukorrhea has been noticed at times but never sufficient to cause annoyance and not noticeable recently

She has had 2 children seventeen and fifteen years old respectively and 2 abortions in the early weeks of pregnancy The labors and abortions were spontaneous necessitating no operative procedures In other respects she has had no illnesses since those of childhood except an attack of influenza in 1918

Examination reveals a woman short in stature and obese with soft and flabby tissues The thyroid gland is not palpable the heart and lungs are normal blood pressure consistently low systolic never more than 118 diastolic 78

The blood shows no decrease in coagulability leukocytosis 6800 hemoglobin estimation 85 per cent the urine shows no albumin or casts and no sugar the temperature has shown no elevation above normal during the week the patient has been under observation the Wassermann test is negative

The abdomen is obese protuberant relaxed and pendulous with diastatic musculature There are no palpable masses and no tender points

The vaginal introitus is moderately relaxed and gaping with a small rectocele and some degree of prolapsus of the anterior vaginal wall permitting descensus of the bladder and a straightening out or sagging of the urethra The vagina is deep but not distensible being in a measure constricted despite the outer relaxation The cervix is multiparous but closed and small and it points down and back toward the hollow of the sacrum The corpus uteri is enlarged hard and asymmetric its anterior wall appearing to bulge into a rounded prominence Altogether the uterus is the size of a three months pregnancy It lies in the left and posterior portion of the pelvis and is very freely movable The appendages are apparently normal

In view of the symptoms complained of and of the findings

as described, we have made a diagnosis in this case of fibromyoma of the uterus, complicated by a moderate degree of perineal relaxation. Our idea is that there are one or more small fibroid growths in the wall of the uterus and possibly a submucous pedunculated one. It is entirely possible however that we have here a case of chronic subinvolution or fibrosis uteri producing the so called essential or myopathic hemorrhage. Mucosal changes such as the development of polypi or diffuse hyperplasia may also have occurred.

Other conditions which must be considered in differential diagnosis are incomplete abortion, ectopic pregnancy, general systemic disorders and malignancy. Though not impossible it is scarcely probable that abortion or extra uterine gestation has produced symptoms for so long a time as eleven months. Examination shows no evidence of cardiac or cardiovascular changes, nephritis, pulmonary or hepatic disease and like conditions. Carcinoma or sarcoma is of course a very possible cause of the uterine hemorrhage though by this time it should be accompanied by a foul watery discharge and other evidence of malignancy. Indeed the differentiation could be very easily made by a preliminary curetment if one thought carcinoma the most probable condition presenting in this case.

At the present day the surgical treatment of small uterine fibromyomata or of fibrosis uteri lies between the application of radium and ablation by either myomectomy or hysterectomy. The subjection of the uterus in this case to 1500 or 2000 millicuries would no doubt be the simplest method of stopping the bleeding and were the patient ten or fifteen years older I should regard radiotherapy as preferable to other operative procedure. The introduction of radium is but a minor surgical procedure requiring simple dilatation of the cervix and a light anesthesia for a few minutes. Moreover radium is effective in checking or controlling uterine hemorrhage in a large proportion of cases. On the other hand its action is destructive at least temporarily to the ovarian function, an undesirable result in a woman the age of the patient under consideration. In addition the effect of radium on the tumor is often only

temporary and cases are now reported in which radium has been used and in which some time later bleeding has again occurred and the tumor has renewed its growth. In my own experience I have seen 2 cases both in young women in which the hemorrhage did not cease until three months after the introduction of the radium only to return with dysmenorrhea after five and six months respectively. It would appear therefore that radium is best applicable to uterine hemorrhage in cases in which the patient's condition is such as to render operation inadvisable or in which she is forty five or more years of age. In the present instance the patient is a poor woman who has to work for her living and that of her children and she desires to return to her work as soon as possible and as permanently cured as possible. I have therefore elected to treat her by removal of the diseased organ.

With the patient anesthetized and prepared for operation in the perineal position I desire to examine her again before final decision as to the choice of route for operation. In any event we shall have to perform anterior colporrhaphy and colpoperineorrhaphy. The uterus is found to be definitely enlarged, hard and free and I can make out no thickening or fixation about the appendages which indicate adhesions. The uterine fundus does not rise above the plane of the pelvic inlet and the anterior wall contains a somewhat rounded prominence. The cervix while not thickened is rough and through the speculum is seen to bear a follicular erosion. The sound passed into the uterine cavity shows a depth of 5 inches, fully twice that of the normal nulliparous uterus.

The conditions for vaginal hysterectomy are chiefly three: (1) That the uterus be not too large; (2) that it be not too fixed by adhesions or infiltration of surrounding tissues; and (3) that it be not malignant. As far as enlargement of the uterus is concerned many abdominal hysterectomies are performed where the organ is altogether suitable for extirpation by the vaginal route. A uterus two or three times its normal size need be no contraindication for vaginal removal. It is preferable of course that no adhesions be present but light bands or veils that can

be readily broken up with the finger and that are not vascular prove to be little or no hindrance to extirpation from below. Only when adhesions are dense enough to produce fixation as in general pelvic peritonitis or pyosalpingitis or when the parametrial tissue is densely infiltrated is vaginal hysterectomy contraindicated. I aim to avoid the lower route in every case where I believe there has been a suppurative process.

Many operators regard a narrow vagina as a contraindication only where this constriction constitutes an actual stenosis; is operation impossible or at least unwise. Enlargement of the vaginal tract by paravaginal section solves this problem satisfactorily in the ordinary case.

The advantages of operating by the vaginal route as compared with the abdominal lie chiefly in the lessened reaction to the procedure on the part of the patient. In the hands of skilled and experienced operators the greater technical difficulties met in the vaginal route are overcome in a measure. But where these are sufficient to prolong unduly the operation the danger of infection is increased and the abdominal route becomes preferable. These difficulties are due chiefly to enlargement of the uterus as in fibroid growths and to adhesions. Where the uterus is so enlarged as to require extirpation by morcellation or where the adhesions are such as to leave raw areas necessitating peritonization the abdominal route is the only logical one. Tumors of the appendages particularly ovarian cysts also produce conditions favoring abdominal section.

**Vaginal Section The Schuchardt Incision**—In this particular case we have then a uterus somewhat enlarged but free and a vagina somewhat constricted in its upper portion. In order to insure ease and therefore speed in work I shall first enlarge the vaginal canal. With two fingers depressing the perineum the left labium is put on the stretch and divided with the scalpel between its mid and lower thirds. The incision is carried up the vagina along the junction of its lateral and posterior walls thus splitting the canal as deeply as desirable to the vault if necessary. In this case I have stopped somewhat short of the cervix. On the skin surface I now con-

tinue the incision in a curve outside of and encircling the sphincter ani on its left until the lower angle of the wound reaches a level with the posterior anal margin. I estimate this to be sufficient in extent for the purpose of the present case. The entire incision is now deepened until the inner surface of the canal of the levator ani and the pararectal space is exposed. Bleeding points which are not as profuse as one might anticipate are clamped and ligated.

Paravaginal incision is an extremely helpful procedure as is now evident for I am thus enabled to reflect the rectum and anus posteriorly and to the right thus giving adequate room for the work to follow. It is in effect an extended episiotomy wound going higher deeper and farther out on the skin surface. When carried to its fullest extent as originally devised by Schuchardt and developed by Schauta and others the incision extended from the vaginal vault through the labium and out around the sphincter ani area to the coccyx. It then divided the vaginal canal left labium skin of the perineum lateral anal region superficial fascia bulbocavernosus and transversus perinei muscles lower part of the triangular ligament paravaginal and pararectal tissues outer fibers of the levator ani muscle near the sphincter ani and coccygeal attachments and the cellular tissues of the ischioanal fossa. It passes below the vestibular bulb and the Bartholin gland and cuts branches of the perineal and inferior hemorrhoidal vessels. These bleeding points are readily accessible for ligation as has been seen. Very little more dissection as when I separate the vaginal vault from the posterior lip of the cervix will bring into exposure the peritoneum and parametria. This incision as employed today is of value chiefly as an aid in hysterectomy and in the closure of extensive urinary fistula the latter indication having been recognized to advantage by Ward and Corscaden.

A gauze dressing is laid over the wound and a hanging speculum is placed in the vagina. With two vulsella the cervix is now grasped both lips together and traction is made. It is seen that the cervix comes well down toward the introitus so that

the entire anterior vaginal wall is exposed. Here the lower portion pouches forward permitting the urethra to straighten out and the bladder to prolapse in a moderate degree. Inasmuch as the pelvic floor is to be weakened by removal of the uterus the relaxation will be treated as for cystocele. Mild degrees of relaxation of the anterior vaginal wall are often taken care of by posterior fixation of the cervix as when ligamentopexy is performed for uterine retroversion with or without decannulation and by adequate perineorrhaphy. When however slight relaxation is in danger of being increased anterior colporrhaphy and cystopexy or colpovesicorrhaphy as the procedure is also called becomes necessary.

**Anterior Colporrhaphy**—With the cervix uteri drawn well down I pick up the anterior vaginal wall with a vulsellum 10 cm behind the urinary meatus. From this point I cut through the vaginal wall in its median line directly back toward the cervix and as far as the vaginal reflection on the cervix. Here the line of incision is deviated and made to encircle the cervix passing about it first on the left then on the right side the two semicircular incisions meeting on the posterior cervical wall. I now undercut the edges of the mesial portion of the wound along the anterior vaginal wall first on the right side then on the left. These edges are grasped in the bite of small clamps two on either side placed equidistant and given to the assistants. With a small gauze sponge I bluntly dissect the vaginal wall on either side away from the bladder cutting with the scissors such fascial bands as resist. I take pains to keep as close to the vaginal mucosa as possible so that all fascial tissue is left attached to the vesical wall. In this manner the bladder is mobilized extensively and the dissection carried forward beneath the vesical neck and urethra.

Posteriorly the cervical attachment of the bladder is exposed by the reflection of the vaginal flaps which are now held widely apart by the assistants. For the present no excess of vaginal mucosa is removed. The denser fascia uniting cervix to bladder is cut through with the scissors after which I am able to wipe the bladder away from the cervix with gauze until the peri-

toneum is exposed in midline and the broad ligaments laterally. Further separation of the bladder from its pillars and the vesico uterine ligaments is done with the scissors keeping the vaginal mucous flap as thin as possible until laterally the structures become denser and dissection may again be blunt.

As has been demonstrated in this case mobilization of the bladder far from being difficult is readily carried out. The tissues are seldom very vascular such oozing as has occurred will be taken care of by the suturing that is to follow. Occasionally a spurting vessel will have to be ligated. Where bleeding is free it is usually venous and can be controlled temporarily by hemostatic forceps. A light gauze dressing is now placed in the wound behind the symphysis. This permits exposure posteriorly and here the vaginal wall already cut through is stripped away from the cervix until the peritoneum of the posterior culdesac is exposed. Owing to the fact that the tissues of the posterior vaginal wall are more vascular this portion of the incision may be deferred until the present stage of the operation.

**Hysterectomy**—The cervix is still held beneath the symphysis the peritoneum has been exposed anteriorly and posteriorly the vaginal walls have been freed from the cervix laterally and we are now ready to extirpate the uterus. This is done in the following stages:

1 *Opening the Pouch of Douglas*—With a tissue forceps in the left hand I pick up the exposed peritoneal fold and pull it away from the cervix. With the scissors this is now snipped through carefully and the incision is extended on either side to the broad ligament. This incision should be made with a sharp instrument and not by tearing with the finger. A ragged peritoneal edge is to be avoided here as well as if one were operating through the abdomen. This freed peritoneal edge I now unite with a single over and over stitch of light catgut on a cutting needle to the edge of the posterior vaginal wall in midline for the purpose of subsequent peritonization. With the peritoneal edge in a fixed position I shall not have to search for it later on.

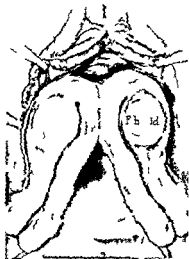
when ready to close the wound The stitch is also of some aid in effecting hemostasis

2 *Ligation of the Broad Ligaments* —The cervix is now lowered and held in midline I pass a ligature carrier, armed with No 3 iodine catgut through the left broad ligament between the vaginal wall and cervix This is tied and the tissues are cut away close to the cervix A second ligature placed higher takes in the uterosacral ligament This in turn is cut free and then the lower portion of the right broad ligament and the uterosacral ligament are ligated and cut away

3 *Opening the Anterior Culdesac* —With strong traction on the cervix and a retractor held under the bladder the peritoneum is readily exposed anteriorly This is opened as has been described by picking it up with a tissue forceps and cutting through it with the scissors The opening is made transversely extending to the broad ligament on each side Examination with two fingers anteriorly and posteriorly discloses that the uterus is enlarged hard and symmetrical There are no adhesions but the fingers are unable to reach fully to the fundus The appendages are readily palpable and found to be free the ovaries being normal in size

Ordinarily at this time I should bring the fundus into sharp anteversion by grasping the corpus as high on its anterior wall as possible with a vulsellum forceps and making traction thereby at the same time pushing the cervix back into the hollow of the sacrum If the intestines or omentum come down into the field of operation a small laparotomy pack with a clamp attached to its type is passed through anteriorly the bladder being retracted behind the symphysis The small uterus is brought out readily and the medium sized one with but two or three grasps of the vulsellum The advantage of reversing the organ in this way is that its extirpation from above downward is then made possible and with traction on its fundal end the ureters and uterine arteries are separated exactly as in operation by the abdominal route In this particular case however the uterus is too large to be brought out into anteversion Likewise as it is pulled down from below its bulk is

seen to entirely occlude the wound in the vaginal vault. Accordingly I shall expedite further work by bisecting the organ mesially a method which simplifies very much the removal of an organ the size of this one but before doing this we



necessary hemorrhage will be avoided by ligating the uterine arteries

4 *Ligation of the Uterine Arteries*—This is done by passing another ligature on either side as closely as possible to the uterus and cutting the tissues if necessary even into the muscularis. In this way the ureters are safely avoided.

5 *Bisection of the Uterus*—I now separate the two vulva holding the cervix and with a pair of heavy scissors cut through the anterior uterine wall from the external os upward and in the median line. The posterior wall is then split in the same way and this incision is extended alternately anterior and posterior until the entire cavity is exposed. As soon as this is laid bare but before the fundal wall is severed through its crest that is before the open peritoneal cavity is exposed the mucous surfaces are carefully swabbed first with tincture of iodine and then with alcohol. This case demonstrates very well indeed how readily an enlarged uterus such as this can be brought down into complete exposure by the simple expedient of splitting it. It is also observed that there is no hemorrhage the two cut surfaces oozing but slightly.

Further reduction in the size of the uterus is now possible. It has been noticed that the bisection of the anterior wall cut through an interstitial fibroid growth about 6 cm. in diameter

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Fig. 491.—1 The anterior vaginal wall has been opened up and the prolapsed bladder dissected from it and from the cervix uteri. The uterus has been drawn down and isolated and the peritoneal cavity opened both anteriorly and posteriorly. On the left side a ligature-carrier is being placed on the upper portion of the broad ligament directly beneath the round ligament and appendages. 2 The uterus has been split mesially exposing the cavity and the fibroid growth in the anterior wall. To further decrease the size of the uterus the fibroid is shelled out enabling each half of the uterus to be pulled down more readily after the exposure and ligation of the appendages. 3 The uterus and tubes have been removed. The round ligaments have been ligated separately and are stitched each to its respective vaginal wall as far down as they can be drawn. 4 The upper portion of the anterior vaginal wall has been closed with the round ligaments (A) united beneath the bladder. The broad and uterosacral ligaments are stitched to the vaginal wall in the vault so that at the completion of the closure the vaginal vault is held up in the pelvis.

situated a short distance below the fundus. The two halves of this tumor are now easily shelled out of their capsule thus permitting the walls to collapse to a considerable extent. It is remarkable how accessible to exposure for extirpation a uterus becomes by being first freed of its fibroid growths.

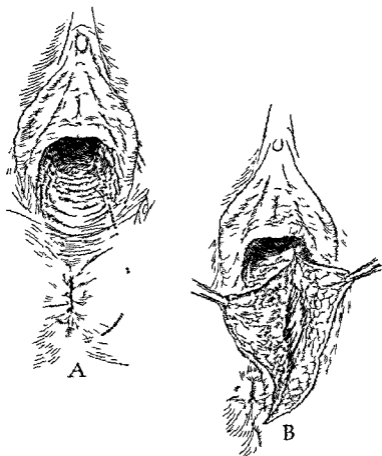


Fig. 492.—A The line upon which the paravaginal section is made. B The vagina has been divided along the line shown. A thus being the right and the left halves of the uterus reflected to the right and left.

As soon as the bisection is completed through the fundus the two halves of the uterus are held apart while a small gauze pack is introduced into the pelvic cavity for the purpose of

preventing any protrusion of the omentum or intestine. The long tape attached to this pack leads out over the symphysis and to it a forceps is clamped.

6 *Ligation of the Round Ligaments and Extirpation of the Tubes*—The right half of the uterus is allowed to hang subject to the traction of its attached instruments while the left half is removed. A vulsellum fixed in the fundus of the left half serves to pull it forward and its attached tube rolls out into view. Though not followed in every case it is my custom to remove the tubes with the uterus in performing hysterectomy. A small hemostatic forceps attached to the fimbriated end of the tube serves by its weight to expose the peritoneal attachment to the broad ligament and ovary. I pass a ligature through this area between the tube and ovary, tie and then cut the tube away from its attachment throughout its length. The long ends of the ligature are cut off and a second ligature is passed about the round ligament close to the uterus and is made to take in as well the uterine end of the ovarian ligament. These ligaments are next severed from the uterus together with the upper portion of the broad ligament and the left half of the uterus is entirely detached. If desired a third ligature may be placed about this upper portion of the broad ligament but for purposes of hemostasis this is not necessary.

The right half of the uterus is removed in the same way. Both of the ovaries are normal; the right one contains a corpus luteum and neither will be removed.

After removal of the uterus the conditions presenting are as follows:

The vaginal wall split mesially has been retracted widely; the base of the bladder has been mobilized and is retracted behind the symphysis. The peritoneum anteriorly and posteriorly forms a continuous opening into the pelvic cavity. Besides the vessels tied ligatures have been placed about the round, broad and uterosacral ligaments. The long ends of these ligatures have been left uncut and the stump cut so generously that moderate traction may be made upon them. The posterior peritoneal edge has been stitched to the edge of the pos-

terior vaginal wall the anterior vesical peritoneal edge is free

The closure of this extensive wound is planned in such a way that the round and upper broad ligaments will be united beneath the bladder to serve as a supporting structure there while the lower broad and uterosacral ligaments will be stitched unto the vaginal vault in order to hold this up in the pelvis. In the ordinary vaginal hysterectomy not associated with colpo-vesicorrhaphy the round and broad ligaments are both stitched into the vaginal vault but here they are to be separated in order to serve a double purpose. In marked cystocele it is often better to bring both the broad and round ligaments together beneath the bladder and to run some slight risk of the upper vagina collapsing but here such a method will not be necessary.

Before commencing to close the wound the excess of vaginal wall is trimmed away. I leave this until the present stage of the operation because one can now best estimate the amount of tissue that is redundant. In the present case it will be sufficient to cut away about 5 cm from each edge. This is done with the scissors and the forceps previously attached are reapplied. The ligatures holding the left round and upper broad ligaments are now pulled down as far as possible beneath the bladder and the ligaments are stitched to the vaginal wall. This is accomplished with one or two mattress sutures of heavy chromic catgut. Each suture is passed first through the vaginal wall from without inward then through the ligament above its ligature next from within outward through the ligament and vaginal wall. The suture is tied its knot lying on the outer mucous surface and the stump of the ligament protruding beyond the edge of the vaginal wall. On the right side the ligaments are fixed similarly.

In our present case the ligaments come down within an inch or less of the urethral orifice. Where relaxation is greater they can be brought usually well beneath the urethra.

Closure of the anterior vaginal wall is now effected with a continuous suture of heavy chromic catgut beginning at the urethral end of the wound and as the needle passes from one

side to the other I reach in with a tissue forceps and pull down the free vesical edge of the peritoneum. This is included in the stitch until all peritoneal slack is taken up. As the suture reaches the point where the stumps of the ligaments protrude it is passed back and forth instead of over and over thus fixing the ligaments even more securely beneath the bladder and into the vaginal wall. When the anterior fornix has been reached the suture is tied. On the left side posteriorly the broad and utero-sacral ligaments are pulled down and stitched into the vaginal vault by two mattress sutures of chromic catgut. The first suture fixes the ligaments into the lateral angle of the wound the second brings the anterior and posterior edges together about the ligaments in such a way as to cause the stumps to protrude. On the right side the remaining ligaments are similarly sutured. Before the last stitch is tied it is necessary to remove the gauze pack. In the present case no other sutures are needed to close the vaginal vault tightly but in some cases one or two additional sutures are required. The long ends of the ligatures are now cut off *en masse*.

The last procedure in this operation consists of the closure of the Schuchardt incision and colpoperineorrhaphy. The paravaginal incision as a procedure taken by itself I close ordinarily by over and over interrupted sutures of iodized catgut approximating tissues from side to side and filling in from below outward. At least two stages of buried sutures are required sometimes three and care is taken to bring muscle to muscle and fascia to fascia. The vaginal wall is reunited by a continuous chromic catgut suture and the skin by interrupted silk. Some surgeons lay a drain from the ischio-rectal fossa to the lowest angle of the wound but I have not found drainage necessary.

When considerable relaxation exists the paravaginal incision is not of course necessary. But in such a case as this complicated by a small rectocele the closure of the Schuchardt incision may be nicely combined with perineorrhaphy. To accomplish this the upper vaginal portion of the wound is closed first by the buried sutures then by the superficial ones. But this closure is not carried to the extent of uniting the

separated fascia of the triangular ligament and the suture of the vaginal wall stops 2 or 3 cm from the labium. The opposing edges of the wound where it passes through the labium are now brought into temporary apposition with a vulsellum and from here on the operation is that for rectocele.

*Exposure*—In order to protect the field of operation from the anus a fresh perineal towel is affixed and its edge is attached with a clip to the skin of the perineum just below the mucocutaneous junction. The tissues of the hymenal remnant on the right side is picked up with a second vulsellum sufficiently high to form a normal introitus when held in apposition with the first (left) vulsellum. It is evident here that the instrument on the right must be placed somewhat lower than that on the left. This will not endanger the symmetry of the orifice when the wounds are closed.

*Incision*—With a pair of sharp pointed angled scissors I snap through the tissues in midline at the mucocutaneous junction and from this point cut up to the vulsellum on each side. Changing now to blunt straight scissors I separate the vaginal mucosa from its underlying tissues reflecting the flap upward as it is developed. As soon as the dissection is beyond scar tissue further mobilization is carried on by blunt dissection a gauze sponge being used to wipe away the vaginal mucosa from the fascial tissue laterally and from the rectum in midline. The protruding portion of the rectum the rectocele is thus readily separated and pushed back. Holding the edge of the flap by tissue forceps and with two fingers in the vagina making counterpressure there is no great danger of injuring the rectal wall. Where bands of fascia are too resistant for blunt dissection I snap through them with the scissors cutting always close to the vaginal mucosa.

In this case but a small portion of the flap need be removed. With a third vulsellum I pick up the flap in midline 2 cm above its free edge or at the point corresponding to the crest of the rectocele. The tissue below this vulsellum is then trimmed away with the scissors cutting across from the vulsellum on the left to that on the right. Obviously this unites the lower

portion of the Schuchardt incision on the left with the perineorrhaphy wound and permits the exposure of a transversely oval area the relaxation present representing a moderate diastasis of the levator muscles. With my finger I now free the underlying rectum from the fascial sheath for a short distance on the right side. On the left side the sheath is open and the levator is already accessible. The right sheath or triangular ligament is split longitudinally by passing through it the point of the scissors which are then opened and withdrawn thus exposing the levator on the right side.

*Suture*—With iodized catgut of proved tensile strength threaded upon a curved cutting needle I now unite the muscle edges of the two levators in midline by over and over interrupted sutures. The first stitch is placed as high as possible and its first loop picks up the under surface of the vaginal wall thus preventing the formation of a dead space above and securing approximation of the vaginal floor to the underlying fascia and muscle. As these stitches are tied I push the rectum back and upward with the index finger. It is not necessary in this first row of sutures to pass the needle deeply thus rolling out from beneath the fascia thick muscular layers for approximation. It is sufficient to bring the edges together with little or no tension and no effort need be made to separate the transverse perineal muscle from the levator as is described by some authors.

The second stage of suture unites the fascial sheaths their two edges already exposed being brought together also without tension. Again my uppermost stitch includes the vaginal wall and the last one passes through the subcutaneous tissues of the perineum. Above this tier of sutures two other stitches are usually needed to bring together the more superficial lateral structures. When these upper stitches are tied the two lateral vulvella are closely approximated. We now see the perineum virtually reconstructed. All that remains is to unite the vaginal mucous membrane within and the skin edges of the two wounds without.

*Closure*—The midvulvellum is now pulled down between the

two lateral one and as a result two short sulci in the mucous surface are left open one on either side that on the left being the deeper These I close with continuous chromic catgut sutures and the three vulsella are removed The cutaneous wound in midperineum is a short one and is closed with three interrupted sutures of silk which after being tied are not cut short Their ends are left long and are tied together in a common knot The cutaneous edges of the Schuchardt incision are approximated also by interrupted sutures tied and knotted together in the same way A light gauze pack is placed in the vagina to serve as a surgical dressing for two days Outside a perineal dressing is applied

As regards the method of perineorrhaphy here employed the debatable point technically hinges on the question as to whether the levators should or should not be isolated and sutured separately This phase of the procedure appeals to many surgeons because it meets the anatomic requirements in the closure of hernia Others regard it as unnecessary and claim as good or better functional results by direct aponeurotic approximation In my opinion this is a difference of little importance in younger women and I cannot agree that isolated levator suture gives unsatisfactory functional results Without question it forms a superior hernia operation and if properly performed does not construct a perineum too massive or rigid Dystocia should not follow this method more readily than it follows any other that is successful In case of obstruction at the outlet during labor episiotomy is as justifiable after perineorrhaphy as in the primipara In young women such as our patient of this morning where pregnancy is not to follow there should be no question as to the superiority of the method followed On the other hand in cases of procidentia of long standing and particularly in elderly women where atrophy and loss of elasticity exist it is best not to attempt direct approximation of the levators but to unite fascia to fascia directly

